THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. APRIL 11, 1895. CHICAGO, ILL. NUMBER 15.

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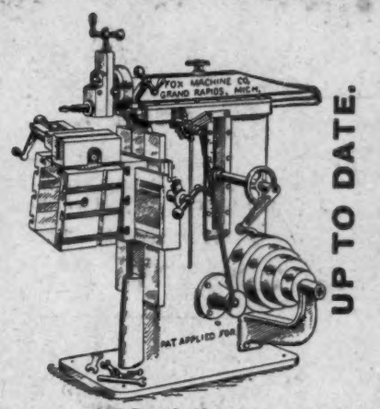

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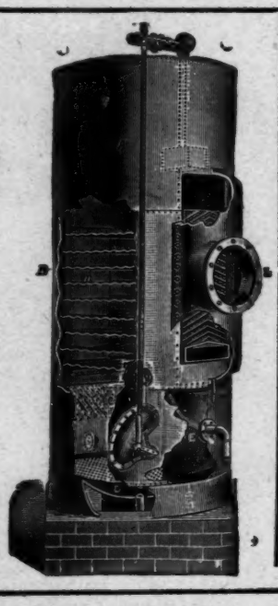

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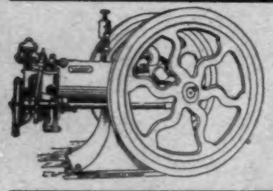

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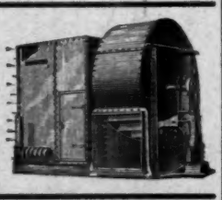

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THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. APRIL 11, 1895. CHICAGO, ILL. NUMBER 15.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

In brief, the week's developments in iron have been further transactions in iron ore in which the leading Pittsburg interest has figured largely as a buyer; continued firmness in Bessemer pig, with the basis still $10.65 at Pittsburg; less strength in steel than was apparent a week ago; and in finished material a more contracted demand than many in the trade had looked for, with spring fairly opened. There is a disposition by buyer and seller to take bearings from events, now that advances in raw materials are a matter of record. The habit of buying each time at a lower price than the last seems to have made some buyers incapable of action in the face of an advance. Coke-buyers are holding off; buyers of Bessemer pig wait, and consumers of billets are encouraged by recent signs of weakness to postpone purchases still further. It does not appear that any $1.35 contracts for coke have been entered into for the second quarter of the year, though there are reports of new deals at somewhat lower figures. The question uppermost in connection with all calculations is the outlook for various forms of finished product. Pig iron stocks increased in March, though less than in the month preceding and there has been a somewhat lessened production in the districts contributing the bulk of the Bessemer pig. The furnace output continues to be in excess of current consumption, and the time of year is at hand that will demonstrate what basis exists for the reckoning that the mills will overtake the furnaces, without any marked curtailment in the active capacity of the latter. Northern makers of foundry and forge irons talk of such an advance in prices as will cover the increased cost of coke, and some of them have announced a higher figure, but current transactions do not show any betterment, save that there is an end to going below a well defined minimum. There is likely to be considerable unevenness in the market until all the low-priced coke contracts expire. While recent events have imparted a firmer tone to all mill product markets, orders are taken at the old prices. Strange as it appears, there is more firmness in manufactured iron than in finished steel, due doubtless to the prospect that the second Cleveland meeting of bar iron manufacturers, adjourned from Chicago, will perfect an agreement for better prices, with territorial adjustments, as outlined in our Chicago market report. The Chicago market, in all lines, seems to have been the most active the past week, attributable in part to the better prospect for Western roads. The belief that general business conditions are improved still persists, and the opinion is shared by many that the present season of waiting in some departments of the iron market will soon be succeeded by a strong buying movement.

THE CLEVELAND OUTLOOK.

With the sales of the past week, it is probable that between 4,000,000 and 4,500,000 tons of Lake Superior ores have been sold for 1895 delivery. In addition to the purchases made by the leading Pittsburg interest, which are put at close to 1,500,000 tons, with a portion of its requirements yet to be supplied, there has been buying by furnacemen in the Wheeling district, Central Ohio and the two valleys. The result is that practically all the extra-low phosphorus ores have been taken and the bulk of standard Bessemer hematites. The prices secured have been the minimum established by the producers of old-range Bessemers. Republic No. 1 has sold at $3.30, Minnesota No. 1 at $3.40, and Lake Angeline and Lake Superior extra-low phosphorus ores have brought $3.55, as against $3.50 last year. As heretofore noted, the price paid for Norrie was $2.90, for Aurora $3 and for Chapin $2.55. These three ores have been well taken up in the buying of the past ten days. There has been no extensive chartering the past week. The 80-cent season rate from the head of Lake Superior seems well established. Marquette business can be done for 70 cents for the season and a limited amount of short-season tonnage was taken from Escanaba at 50 cents. The 80-cent rate from the head of the lake is really better than the same rate last year, as the appliances for rapid coal handling provided this year at most docks will permit of more trips in a season than has been possible heretofore.

Pig Iron. Some sales of Bessemer pig have been made in the past week at $10 valley furnace; in other cases offers of $10—in one instance on 5,000 tons—have been declined. The fact that Pittsburg and Ohio steel works covered upwards of 300,000 tons in the purchases of some weeks ago makes it possible for those interests to wait until the market has made the transition to whatever basis the new coke and ore prices may eventually bring, and a strong demand is not looked for in the next few weeks. However, such buyers as come into the market seem willing to pay $10.65, Pittsburg, and a higher offer is known to have been made on one lot of metal the past week. The accumulation of Bessemer stocks in near by districts is at a lessened rate, owing to the inactivity of several furnaces. The Cleveland Rolling Mill Co.'s stacks are out temporarily for repairs and when they resume hot metal will be carried directly to the mixing vessels at the steel works. In the coke shuffle one Northern Ohio furnace has changed to the Pocohontas product, the price being less than that of Connellsville coke on the new basis.

Finished Material. An adjourned meeting of the Western bar iron manufacturers is now in session in Cleveland, and it is expected that some agreement will be reached that will assist in stopping the demoralization that has so long plagued that trade. The week has brought the semi official announcement that the next Amalgamated Association convention will take a stand for a return to $5 puddling. It need not be said that such a move following the concession made by the manufacturers at the Youngstown conference will find the latter fully prepared to join issues. Spring work has brought quite as good a call for building steel as that of last year, but no large work is in sight. A big boat to be built at Bay City will furnish a good sized plate order, which is not placed as yet. Beams and channels are on a 1.20c. basis Pittsburg. A 5,000-ton steel rail contract is about to be let in the Cleveland district, with the probability that it will go to Chicago.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The two principal topics of conversation among iron and steel men in the past week were the higher prices made on local pig iron, and the meeting of the bar iron men. The local furnaces have raised their prices on their product because of the advance in the price of coke, and are very firm in their intention to hold to the quotations now made. The meeting of the bar iron men did not result in any definite action, but there is a general feeling that the further meeting to be held at Cleveland this week, will result in some kind of an arrangement to hold for better prices. Business in pig iron has been quite large, and the outlook is excellent for the immediate future. Bar iron has been quiet, both buyers and sellers being rather disposed to wait until after the Cleveland meeting before doing much business. There is larger inquiry for rails but sales have not increased as yet. Other classes of material are doing a little better every week, and last week was no exception.

PIG IRON.—The early part of last week the three local furnaces raised their quotations 25 cents per ton, as a result of the advance in the price of coke. The advance price obtained for Bessemer ore will only affect the local pig iron market by lessening the difference between coke malleable Bessemer and Lake Superior charcoal iron. There are no indications that higher prices will be paid for non-Bessemer ores. Some iron men incline to the opinion that the advance in foundry pig will be considerably more than sufficient to cover the increased cost of fuel. Sales in the past week were quite heavy, several orders of from 500 tons up having been taken, two or three of them being for 1,000 tons. Inquiries are still large, one being in the market for 5,000 tons. It is probable that the sales for the next few weeks will be larger than those of the past two or three. Southern iron has sold well, although no single orders larger than 500 tons have been taken. The aggregate for the week is not quite as large as that of the week before, but the demand keeps up well, and sales will continue large for some time. Prices are no higher, but the Southern furnaces are much more inclined to be firm, as a result of the advance in Northern irons, and it is quite probable that they too may raise their prices a little. Lake Superior charcoal is quiet, with only small sales being made. Quotations are now made as follows:

Lake Sup. Charcoal.....	$13 00@13 50	Southern No. 2 Soft.....	$ 9 75@10 00
Local Coke Fdy. No. 1...	10 50@10 75	South'n Silveries No. 1.	11 50@11 75
Local Coke Fdy. No. 2...	10 00@10 25	South'n Silveries No. 2.	11 25@11 50
Local Coke Fdy. No. 3...	9 75@10 00	Jackson Co. Silveries...	15 00@16 00
Local Scotch Fdy. No. 1.	10 50@10 75	Ohio Silveries No. 1.....	14 00@14 50
Local Scotch Fdy. No. 2.	10 00@10 25	Ohio Silveries No. 2.....	13 00@13 50
Local Scotch Fdy. No. 3.	9 75@10 00	Ohio Strong Softeners...	12 50@13 00
South'n Coke No. 2.....	10 00@10 25	Alabama Car Wheel.....	17 50@18 00
South'n Coke No. 3.....	9 50@ 9 75	Malleable Bessemer.....	11 00@11 50
Southern No. 1 Soft.....	10 00@10 25	Coke Bessemer	11 00@11 50

BARS.—The week has been quiet as regards sales, as none of the bar manufacturers care to press sales of large lots until the action of the meeting at Cleveland during the present week is known. What sales have been made, however, have been at a higher price than has been prevailing for some time, the standard quotation at present being about 1.10c for guaranteed iron. It was stated by the agent of one mill that the price decided upon at the Chicago meeting last week was 1.10c rates, half extras, at all points where there is a mill located; where there is no mill, the freight rate from the nearest mill is to be added. From another source it was learned that three prices are proposed, one for Ohio as far west as Toledo, another for Chicago and St. Louis and common points, and another for central territory. It is probable that the final decision of the meeting to be held this week will be a modification of these two plans, or something similar. No action has been taken so far on steel bars, which are at present quoted at 1.20c to 1.25c.

RAILS AND TRACK SUPPLIES.—Sales in the past week were not much larger than in the week previous, but the local manufacturers are feeling quite encouraged over the outlook, as inquiries are for larger amounts and are more frequent. The recent heavy rains in the West and Northwest will have a beneficial effect on the crops, and as a consequence railroad men are feeling better, and are more inclined to consider the placing of orders. Prices are unchanged as follows: Rails, $23 to $25; splice bars, 1.20c to 1.25c; track bolts, 1.95c to 2c; spikes, 1.65c to 1.70c.

BILLETS AND RODS.—Aside from a sale of 1,500 tons of tin plate bars at $18 50, nothing was done in this market last week. Billets are still quoted at $16.50 and rods at $23 to $23 50.

STRUCTURAL MATERIAL.—Several fairly large building schemes are on the tapis, and at least one, a large office building requiring 1,000 tons of material, has been placed lately. The Atwood building will be let in the near future, bids having been asked on the 1,000 tons required for it last week. The Amusement building spoken of some time ago in these columns, looks now as if it might go through, and if it does about 2,000 tons of material will be required. Besides these a large number of smaller projects are under way, that altogether will require a large quantity of material. The contract for 1,200 tons for track elevation by the Rock Island road was taken by an Eastern mill. Prices are inclined to be firmer, and in fact some advances have been made. They are now as follows: Beams and channels, 1.45c to 1.50c; angles, 1.35c to 1.40c; plates, 1.40c to 1.45c; tees, 1.70c to 1.75c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—The order for ship plates taken recently by the Illinois Steel Co. to go to Newport News was for but 175 tons, and was taken at a very low price because the company desired to have some heavy work to put on its rolls to test them. The demand for plates is larger, and some sales of fair amounts have been made. It seems likely that the tonnage closed in the next few weeks will be quite large, and dealers are feeling encouraged. Prices are unchanged, as follows: Tank steel, 1.25c to 1.35c; flange steel, 1.50c to 1.75c; firebox steel, 2c to 5c. boiler tubes are quoted at 77½ to 75 per cent discount.

MERCHANT STEEL.—Specifications continue to come in with gratifying freeness, and the demand is enlarging considerab'y. Sales were made last week for quite good lots, and the outlook is better. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.50c to 1.60c; smooth finished tire and machinery, 1.50c to 1.60c; Bessemer bars, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SHEETS.—Black sheets are in rather better demand and some good sales were made last week to jobbers. Quotations are still made at 2.25c to 2.30c for No. 27 common, and 2.35 to 2.40c for steel sheets. Galvanized sheets are also in good inquiry, and sales aggregating a good tonnage were made last week. Quotations are made at 70 and 10 and 10 per cent off.

OLD RAILS AND WHEELS.—A good sized transaction is reported in old iron rails at $10.75, Chicago. Old steel rails are quiet, and are quoted at $7.50 to $9.50, according to length; old wheels, $9.

SCRAP.—There is a large demand for heavy melting steel scrap, and negotiations are under way for consider-

able tonnage. Other grades of scrap are in good demand, at prices as follows: Railroad forge, $8.50 to $9; dealer's forge, $7; No. 1 mill, $6 50; No. 1 machinery, $7; axles, $12 to $12.25; cast borings, $3.50; wrought turnings, $5.25; axle turnings, $6.25; mixed steel, $5; heavy cast, $7 to $7.25; stove plates, $5 to $5.25; heavy melting steel, $7 to $7.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. There has been no special activity in any part of the local market the past week, barring considerable sales of ore, of which a large tonnage was taken by the leading interest here, the advance in prices ranging from 5 to 25 cents, according to the grade and content of the ore, over last year's figures. Bessemer pig holds the advance noted a week ago and is fairly $10.65 for May and June delivery; but soft steel billets and slabs do not keep pace with Bessemer iron. There are scarcely any billet transactions to report, but the market may be fairly quoted at $15.35, with the indications that this figure can be shaded. Reports from the Cleveland district indicate weak prices there. Forge iron is stronger. A sale of 1,000 tons is reported at $9.25 and this figure is declined by some sellers who hold for $9.50. The demand has increased of late and there are very limited stocks to draw upon. Ske'p iron and steel continue quiet. Structural demand for early delivery is only moderate, yet most of the mills are well employed, and the working forces in all lines of finished production in iron and steel are larger and more fully employed than at any time since the opening of the year. The coke situation is somewhat uncertain. We do not find that furnaces are tying up at $1.35 and some of them seem to be able to get a considerable shade from this price for May delivery. The old contracts at the low prices, some of which will run to July 1, and the sales of coke a few weeks ago by brokers for April delivery, on the $1 basis are factors in the situation. What the outcome will be is yet a puzzle. In general there has been no improvement in the situation over a week ago. The finished material demand has not developed as many would like to see.

Cincinnati. While the pig iron market for the past week has been broader than previously, involving more transactions, at the same time the tonnage is smaller than for several weeks past, the reason being that no very large business has been closed. For the first time in over two years, there is something like a general feeling among consumers of iron, that any further decline in prices is improbable. This is a great point gained, for it means that the extreme hand to-mouth policy that has so long prevailed, may be followed by more liberal purchases. It is certain that many foundries have run their stocks so low that a little delay of supplies in transit causes inconvenience and perhaps stoppage. There is an increase in the melting of iron, and yet the tonnage is still very far below normal proportions. No one class of work seems to be favored beyond others. The agricultural implement men feel some stimulus from the encouraging prospects for crops. Makers of engines and machinery are doing better business, the special activity being more in the line of building of water plants, electric railways, cotton mills and saw mills. Car building still lags in a very disappointing way, but is not stagnant as it was a year ago. A few Northern furnaces have stiffened up in their views materially in consequence of a sharp increase in cost of production, but the business current is taken by those who are still willing to accept low prices. In Southern irons the special concessions that were frequent until a short time ago are no longer made, and regular prices are insisted upon no matter how desirable the trade.

Buffalo. Business continues good both in tone and amount. The advance in coke has forced Northern furnaces to advance prices, which for the present has a tendency to check sales of Northern and increase business for Southern makes. Not so many large contracts have been in the field during this week as last, but the subject of pig iron supply is of prominent interest to most consumers at the present time. Buyers are averse to suggestions of higher prices, and on the other hand makers are no better off at the new than they were at the old figures. When the market has adjusted itself to the new conditions it will probably be observed that a stronger condition has been imparted to the trade.

St. Louis. There has been a good demand for iron the past week by all classes of consumers. Several deals of 500 to 1,000 tons have been quietly closed. There is every indication of increased activity in the iron trade. The advance in Connellsville coke has had an influence on the price of Bessemer and Eastern iron, which will possibly be reflected by an advance in Southern irons.

Personal.

Horace V. Winchell and F. F. Sharpless, of Minneapolis, have been at Prosper, Coos Co., Ore., for several weeks examining mining properties, and will be engaged there until about the middle of April.

C. M. Schwab, general manager of the Homestead Steel Works, returned from his European trip a few days ago. In a newspaper interview Mr. Schwab said that English steel makers were amazed when told of the wages earned by the steel workers in the United States. The figures given them were those of the present scale at Homestead, and some of the manufacturers scarcely believed them. They told him it would be absolutely impossible to pay any such wages there, and supposed in the present development of cheap steel it could not be done in the United States.

Wm. A. Roome, who has been connected with Joseph T. Ryerson & Son, of Chicago, for a long time as salesman, has recently connected himself with the sales department of the Illinois Steel Co., and will in the future devote his time to selling the product of the new plate mill at South Chicago.

The Harley Malleable Process.

In a note to *The Iron Trade Review* concerning the process he is developing for the production of malleable iron without the time and expense now required for annealing, Geo. Harley, of Springfield, O., says that his plans are not fully matured. He adds: "I have been experimenting with a small furnace and have had the best results. My iron is strong and tough; will bend but not break, and can be worked in the blacksmith's forge like wrought iron. I am putting up a large furnace to melt six tons an hour, and if I get where I expect, it will change the whole system of melting iron. My invention does away with much hand labor and accomplishes the result at small cost. Castings made by it are stronger, sounder and more reliable than malleable castings and can be produced at less cost than gray iron castings. They can be made of any size up to several tons, and uniformly have strong iron." A company has been incorporated under the laws of West Virginia, with minimum capital of $10,000 and maximum capital of $1,000,000, to take hold of the process commercially.

FOR several days representatives of every wire-drawers' union in the country have been in session at New Castle, Pa., perfecting the organization of a national wire drawers' union. Press dispatches say that all details were completed and that a national scale will be adopted.

THE Portland Iron Works, Portland, Ore., were completely destroyed by fire April 7. The loss is about $400,000.

THE IRON TRADE REVIEW

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FREIGHT DISCRIMINATION CONTINUES.

One of the fields in which the National Association of Manufacturers will find large room for effort is the question of freight discriminations against the manufacturers of the United States. There was some agitation in the metal trade press a short time ago against the injustice of railroad practice in giving much lower rates on tin plate billed through from Swansea to interior points in the United States, than were given on very much shorter hauls to the same destination from American tin plate mills. Though the assurance was given at the time, that the wrong would be righted in part, or at least mitigated, there is practically no change in the condition then existing. The Tin Plate Manufacturers' Association has had to be satisfied with the admission from high railroad officials that a wrong was being done the home industry; to right it seems to be quite another thing. That other lines of manufacture are also sufferers in the same way appears from the following statement of a well known pottery manufacturer quoted by the *New York Shipping and Commercial List*:

The railroads are assisting manufacturers in other countries to ruin our business, and in doing so the companies which give the steamship lines lower rates than they allow us will in time close up our plants and be the greatest losers. English manufacturers can ship into any American city from the seaboard cheaper than we can, although the distance may be far shorter. We formerly had a larger trade in Texas, which has been lost to us because of the low rate arrangement between the steamship companies and the railroads. English manufacturers can lay the goods down in Texas cheaper. I have personal knowledge of the discriminating practices of the railroads. We import a large amount of clay from England, which we cannot obtain readily in this country as yet. We formerly purchased this clay from an importer at Baltimore, and paid $1.80 freight per ton of 2,000 pounds from Baltimore to East Liverpool. Recently we have purchased this clay direct from the producer in England, and when billed from Liverpool to East Liverpool we paid only $1.25 freight for a ton of 2,240 pounds between Baltimore and East Liverpool. This is how the American manufacturers generally are treated by the railroads, and it is a gross injustice which should be stopped. On the Texas shipments I referred to the railroads carried the foreign goods from the port at one-third less cost than the same goods could be shipped from East Liverpool. Against such unequal conditions we have an uphill fight and the Inter-State Commerce Commission should see that the railroads are brought to time.

The inexplicable thing about this abuse is the persistence of the railroads in keeping it up against their own interest. For every ton of finished product from foreign mills and factories which they receive from steamship lines they would have the carrying of from two to four tons of material raw and finished, were the articles manufactured on this side. American tin plate works, for example, give the railroads the hauling of steel slabs or bars, tin, lumber, oil, acid, fuel and other material, over and above the boxed tin plate which is the sole contribution of the steamship lines with which the discriminating combination rates are made. And when the processes farther back are taken into account, the hauling of ore, flux, coke, pig iron, coal, and the other incidental freight involved in iron mine, blast furnace and steel works equipment, the account readily runs up to four tons of freight from the native industry to every ton represented by the imported finished product. What is the hidden spring which our home manufacturers have been unable thus far to touch?

IRON AND STEEL IMPORTS.

The February, 1895, imports of iron and steel into the United States show a falling off from those of the preceding February, and a decided decrease from those of January this year. The following table compares the returns of February in the two years and of the eight month periods ending Feb. 28, 1894 and 1895:

	Month ending Feb 28.		Eight mos. ending Feb. 28.	
	1895. Tons.	1894. Tons.	1895. Tons.	1894. Tons.
Pig iron	1,174	1,836	9,898	20 673
Scrap iron and steel	178	22	1 801	1,905
Bar iron	295	319	9 966	8,908
Steel and iron rails			312	2,176
Cotton ties				800
Hoop, band or scroll iron		63	173	436
Ingots, blooms, etc	1,050	441	8,418	9,949
Sheet iron and steel	1,462	1,898	20,339	18,244
Tin plate	15,044	17,393	148,963	131,114
Wire rods	2,120	1,023	15,896	17,575
	21,323	23,015	215,766	211,880

In the January total of 32,398 tons the principal item was 22,492 tons of tin and terne plates. It appears above that tin plate import business fell off sharply in February, being but 15,044 tons, or one-third less than in January. But three lines—scrap, ingots and blooms, and wire rods—show an increase over February, 1894. Pig iron, sheets and tin plates are each considerably less. The total, contrary to the record for some months past, is less than for February 1894. For the eight-month period ending Feb. 28, there is a slight excess over the total for the eight months ending Feb. 28, 1894. Pig iron imports have been steadily lessening as compared with corresponding months of the preceding year. The gain in tin plates which in the eight-month columns is seen to be about 15 per cent for 1895, received a check in February which, in view of the increasing production at home, seems likely to be the beginning of a steady decline of imports of that product.

Iron ore imports in February this year were 21,603 tons; in February, 1894, the total was 8,935. For the eight months ending Feb. 28, 1895, the total was 145,782, against 176,880 for the eight months ending Feb. 28, 1894.

THE Minnesota Legislature has postponed indefinitely the bill devoting one-half the royalties on iron ore mined from State lands to bonuses for blast furnace companies. Duluth, which has been active in agitating the proposition, will now have an opportunity to take up the subsidy movement on its own account.

WHEN buyers begin to send in long delayed specifications, with instructions to hurry the material through the mill, and when there is a broadening inquiry, with a

more urgent desire to cover for two or three months ahead than has been seen at any time since the first of the year, it may be concluded that the market is awaking to a realization that higher prices are ahead. There has been some very solid skepticism on this subject, but the appearances now strongly favor a rude disturbing for some of the doubters.

A Pig Iron Market Worth Cultivating.

A new market for pig iron has been developed in the Northwest, according to a story told by Frank I. Foote, of Foote & Billingslea, the Chicago agents for Rogers, Brown & Co. and the Hinkle charcoal furnace at Ashland, Wis. A letter came a short time ago to the Ashland Iron & Steel Co. from the authorities of the town of Phillips, Wis., a lumber belt town nearly wiped out in the forest fires of several months ago, asking for their "best price on a car load of Hinkle pig iron, delivered at Phillips."

The secretary of the Ashland company took the inquiry in charge, and upon investigation found that there was no foundry at Phillips. He accordingly wrote back, quoting a price on the various grades of iron, and asked what the city authorities wanted of the iron. They replied that the town had been over run with tramps ever since the time of the forest fires, and they had decided to adopt radical methods to rid themselves of the "Hungry Higgins" tribe. They proposed to get the heaviest substance they could, and make every tramp that applied for a meal or lodging carry the pigs of metal back and forth in the city yard until tired enough to sleep without supper. They thought that after a few week of this kind of employment the fraternity would shun the town like a plague. In conclusion they ordered a car of "the heaviest iron the company had in stock."

Mr. Foote is now claiming that Hinkle iron is not only the best charcoal iron made for foundry purposes, but is the best "tramp discourager" on earth. He is thinking of trying for a similar contract in Chicago and some of the other large cities.

Busy Pittsburg Industries.

The Pittsburg *Dispatch* notes an increase in the pay-rolls of the industries in that district, the amount thus scattered by the banks on Saturday, April 6, running into hundreds of thousands. Of the number of wage-earners employed in the mills and factories in and about Pittsburg last week, it says:

"Within the city proper, from Sharpsburg, on the Allegheny, to the Point, the manufacturing plants are running full blast. Around the point and up the Monongahela, on both sides as far as McKeesport, and down the Ohio, the other great iron and steel plants which have made the city famous are turning out thousands of tons of materials every day, which are bringing a vast amount of money to the city. In these mills and workshops over 82,000 operatives were employed last week. In the mercantile establishments it is estimated that 16,000 persons are now engaged, and about 10,000 in the river and railroad coal mines, and 15,000 on river craft and railways, making a total of 123,000 persons now employed in the leading industries of the city. The size of the force at each establishment cannot be ascertained, as it varies from day to day, but generally speaking it can be stated that all the large plants in Pittsburg and vicinity, with but few exceptions, are running nearly to full capacity. The number of mills and workshops idle is comparatively few. Of the former, the only ones idle are in litigation or undergoing repairs after a long run."

The Chapin Mine Pump Leads.

Irving H. Reynolds, mechanical engineer of the E. P. Allis Co., Milwaukee, Wis., writing recently on pumping engines, disputes the claim that the big pumping engines for the Indianapolis water company will be the largest for municipal service constructed in the United States. Mr. Reynolds presents figures to show that the Allis company has built the largest engines in America and some of the largest in the world. Engines for Omaha, the Chapin mine, Pittsburg and St. Louis pumping stations are mentioned in this connection. The respective daily capacities of the engines are given as follows: 8,000,000, 4,600,000, 12,000,000 and 10,600,000 gallons, while the horse power is 1,070, 1,300, 970 and 570. These figures are given to show that it is a mistake to rate a pumping engine either by its capacity or by its horse power, for the reason that the speed of such engines varies greatly and many of the larger machines are operated at such low speed that they develop less horse power than the smaller engines at a higher speed. The quantity of water delivered is also no index of size, for the reason that the pumping head may be great or small. The true measure of size of any engine, Mr. Reynolds says, is the cylinder volume, and judging from this standpoint the Chapin pump easily stands at the head of the list.

F. A. GOODRICH & CO., Inc., is the style of a new Detroit house just organized for the sale of pig iron, steel, coke and foundry supplies, and to carry on a general commission business. The company has been appointed sole sales agent for the Union and Peninsular iron companies, of Detroit, makers of Lake Superior charcoal iron; it will also have a full line of Northern and Southern coke irons, high silicon softeners and Connellsville coke. Mr. F. A. Goodrich, who has been intimately connected with the trade for the past 12 years, being formerly associated with Chas. Himrod & Co., of Chicago, and later with Wm. F. Jarvis & Co., Detroit, will have full charge of the business. Offices have been secured in the new Chamber of Commerce Building.

PRELIMINARY arrangements have been made for a combination of interests which may result in the establishment of steel works at Birmingham, Ala. The Jefferson Steel Co., which owns the old Henderson steel plant, has for some time been negotiating with the Birmingham Rolling Mill Co. and the Sloss Iron & Steel Co. for such a combination. The outcome will probably be that the rolling mill company will acquire the Henderson steel plant, that melted iron will be furnished from the North Birmingham furnace of the Sloss Iron & Steel Co., a few hundred yards distant, and that the hot iron will be made into steel at this plant, the output to be used by the rolling mill company which agrees to take it for a number of years.

L. M. MOYES, late manager of the Babcock & Wilcox Co., has given notice that his patents on the Combine safety water tube boiler cover fundamentally devices for the maintenance of continuous circulation throughout the entire boiler system, the steam and water drums being arranged transversely to the flow of products of combustion in their travel from the furnace to out-take of stack. He notifies those who offer for sale other boilers of this class, for which they claim such continuous circulation, that they are a direct infringement of his patents which it is his purpose to protect to the fullest extent.

MESSRS. Andrew, William, Henry, James and John Wildman, former of Bay City and Saginaw, Mich., have leased the well-equipped shop of the Excelsior Iron Works, in Chicago. The concern is known as the Excelsior Steam Boiler Works. It is prepared to give estimates on all classes of work to be done in a boiler shop, particularly marine work, in which the proprietors have had more than the usual amount of experience, being the builders of some of the largest marine boilers on the lakes.

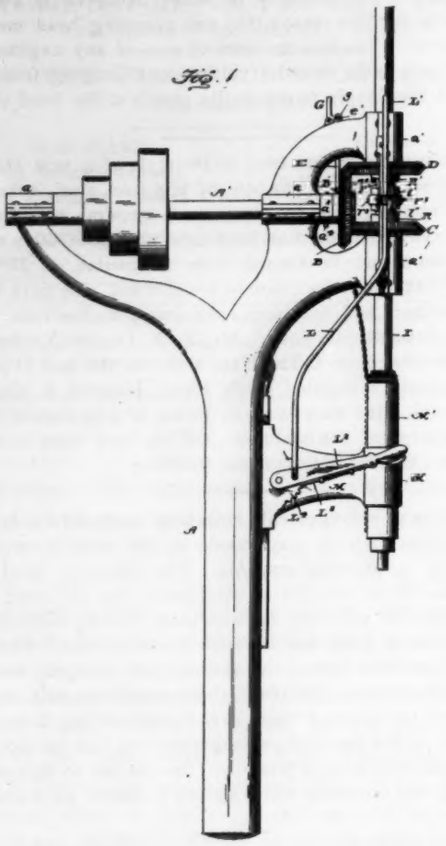
THE Weimer Machine Works Co., of Lebanon, Pa., has received an order from the Iroquois Furnace Co., of South Chicago, for one of its latest blowing engines. The engine will be upright and have a 42-inch diameter Corless steam cylinder, 84-inch diameter improved Weimer air cylinder, and a stroke of 48 inches. The total weight will be 170,000 pounds.

ON May 1, Ed. Wertheim, dealer in asbestos packing and covering and general engineering supplies, will move from his present location 207 Lake St., Chicago, to 55 South Canal St. The new office is among the engineering supply houses of Chicago and is a larger building and much better located than the present one.

ON April 3rd, in one turn of 12 hours, the Bessemer steel plant of the National Tube Works Co., McKeesport, Pa., produced 425 tons of steel billets. There is a single 36″ reversing mill, and all of the company's Bessemer product is finished on it.

DRILLING AND TAPPING MACHINE.

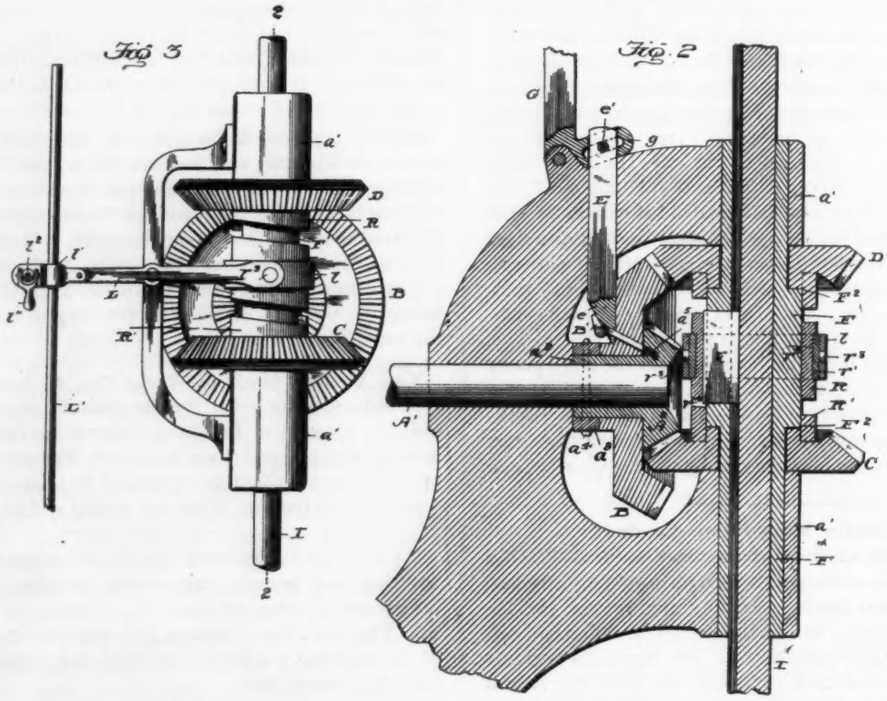
Edwin A. Searles, of Battle Creek, Mich., has invented an improved drilling and tapping machine, the features of which are made plain by the illustrations given herewith. A side



elevation of a portion of a drilling machine with the improvement applied is shown in Fig. 1. Fig. 2 is a central vertical section on the line 2-2 of Fig. 3, and Fig. 3 is a front elevation. The main object of the designer was to provide an operating gearing whereby the rotation of the drill spindle may be readily reversed, to raise the tap after it has cut its thread for a bolt or screw. There is provided a clutch mechanism through which the gearing may be operatively connected with the spindle to run it in either direction or to permit the gearing to run idle. There is also mechanism for locking the two main driving gears together upon the drive or cone pulley shaft or disconnecting them for independent action.

A represents the usual standard or pedestal of a drilling machine provided on its upper end with bearings *a a* for the horizontal drive or cone pulley shaft A′, which is to receive power in the usual manner. The shaft A′ is provided with a bevel gear A^2 at one end. B is a bevel gear of much grea'er diameter than the gear A^2 and it is mounted loosely on the hub a^2 of the latter. The locking pin B′ is used to lock the two gears together so that they will turn as one. F is a vertical sleeve turning freely in bearings *a′ a′* on the machine standard above and below and in front of the gears A^2 B. This sleeve F has an enlarged portion F′ between the bearings mentioned and thus the upper and lower shoulders F^2 are formed, which are engaged by the gears C D respectively, these gears being mounted on the reduced portions of the sleeve to turn freely thereon.. Further details will be understood by reference to the enlarged parts in Figs. 2 and 3.

When a hole is to be drilled, the pin B′ is forced outwardly, and the clutch sleeve R is thrown into engagement with the lower drill gear C, the vertical movement of the drill spindle being effected in the usual manner to feed it down or raise it. If the hole drilled is to be threaded, then the clutch sleeve is moved to its intermediate position and the drill replaced by a tap and then the clutch sleeve is again thrown into engagement with the gear C, until the threading is effected, after which the pin B′ is thrown into engagement with the gear A^2, and the clutch sleeve R is moved up into engagement with the upper bevel gear D which will cause the motion of the drill spindle to be reversed, and its speed greatly increased, so as to rapidly withdraw the tap from the threaded aperture. Thus all of the various adjustments and changes are effected without stopping or reversing the drive shaft A. If the tapping is to immediately follow the drilling, the gears B A^2 need not be disconnected as the gear D will simply run idly during the drilling.



Western Foundrymen's Association.

The next meeting of the Western Foundrymen's Association will take place at the Great Northern Hotel, Chicago, at 7:30 P. M., on Wednesday, April 17. A paper by Mr. Herbert M. Ramp, the well known writer on foundry topics, entitled "Future Improvements in Foundry Work," will be read and discussed. Nominations of officers to be elected at the annual meeting in May, will be presented at this meeting.

It is earnestly desired that all members of the Association be present, and all persons interested in the Association who are not members, are cordially invited to attend the meeting and to take part in the discussion.

CAST IRON CHILLED CAR WHEELS.*

BY WM. W. LOBDELL.

Cast iron chilled car wheels are distinctively an American product, although manufactured to a limited extent in Austria and Sweden. The output, from possibly 10 or 12 wheels per day in 1830, confined to, at most, two or three establishments, has grown to one of millions; the product of more than 100 establishments, controlling millions of capital and employing thousands of skilled workmen.

Comparatively few persons—even if actively engaged in railroad management—have acquainted themselves with their mode of manufacture and consequent characteristics, and, therefore, are often led into unwise conclusions as regards the limits of their efficiency. To such it may be interesting to note that when certain kinds of gray cast iron are melted and poured against a metallic mold, that portion of the iron next to the mold becomes hard, white, crystalline and brittle, while the interior portion remains gray and more or less tough and fibrous. This conversion of the iron that comes in contact with the metallic mold, into the hard, white variety, is called "chilling," and it is upon this principle that the manufacture of chilled car wheels depends. This property of chilling, which certain irons possess, must have been known to iron founders at an early day, for we have evidence of the fact that parts of plows, faces of forge hammers, punches for punching holes in wagon tires, rolls for rolling metal, and various other implements, were chilled long before the manufacture of car wheels.

As the early mode of smelting iron ores was with charcoal, it follows undoubtedly that chilled castings and chilled car wheels were originally made exclusively from charcoal irons; and although later developments have demonstrated that, under certain conditions, coke or anthracite irons possess this property of chilling to a certain extent, they have not come into sufficient prominence for us to consider them as important factors in this branch of manufacture; so that to produce the best results we may consider the use of charcoal iron as indispensable. All irons do not possess the property of chilling, and many that do possess it are not well adapted for use because of characteristics which would render the wheels made from them unreliable.

Noting, then, this peculiar property of chilling, it is obvious that the plates and hub of the wheel must be cast in a sand mold, the result being that they are soft enough to be bored or machined, while the tread is so hard that the finest tempered file will not affect it. What, then, is this peculiar property of chilling? The supposition is that the chemical difference between the chilled portion of a wheel and the plates or hub is simply in the proportion of combined and free or graphitic carbon, that of the chilled part being high in combined carbon, the free or graphitic having been changed to combined by the rapid cooling of the tread by reason of being cast against a metallic mold, technically called a chill.

This rapid cooling of the tread of the wheel—the metallic mold in which it is cast being a good conductor of heat, whilst the sand mold against which the hub and plates are cast is a poor conductor—causes an undue strain upon the wheel, which must be relieved in some manner or the wheel would be unfit for service. With the adoption of the form of pattern such as is used to-day, came the necessity for some mode of slow cooling and annealing. Probably the first method practiced was to take the wheels from the molds in which they were cast as soon as the iron was set, and cover them up in hot sand or ashes and allow them to remain several days until nearly cold. Another was to lay them on the floor and build a fire around the tread so as to bring the temperature of the tread up to that of the hub and plates, and then allow them to cool slowly. To a certain extent both of these methods accomplished the desired results, and were probably sufficient for the requirements of the times in which they were practiced. The latest and probably the best plan is to place the wheels, as soon as they can be removed from the molds, in tight pits lined with fire-brick or some other substance that will stand the heat, ten or more in each pit. The wheels are allowed to remain in the pits several days, and are not removed until all tendency to fracture from strain has been removed.

*Extract from a paper read at the last annual meeting of the Association of Manufacturers of Chilled Car Wheels.

From this hasty résumé of the mode of manufacture, it is obvious that to insure a thoroughly safe and reliable wheel, great care must be taken in the selection and manipulation of the material used, as well as in the treatment of the wheel after it is cast; indeed, so well is this known, that the manufacture of chilled car wheels is considered as entirely separate from ordinary foundry practice, and is carried on in establishments especially adapted to the work.

The efficiency of cast iron chilled wheels depends upon their strength and wearing qualities. If the specifications and physical tests formulated by expert mechanical engineers and adopted by the most prominent railroads of the country—and which are now much more severe and exacting than those first formulated—can be taken as the maixmum required to meet the conditions of the increase in speed and weight of equipment of the present time, then the limit of strength of cast iron wheels has not been reached, as they are successfully met by all reputable manufacturers; and as long as charcoal irons can be produced approximating 35,000 to 40,000 lbs. tensile strength per square inch, it is not likely that the limit of strength will be exhausted until the speed and weight of equipment are increased beyond anything now contemplated. Assuming, then, that cast iron chilled wheels meet all the requirements of the physical test and specifications as to strength and depth and character of chill, we have yet to consider their wearing qualities.

We have seen that the chilling process has transformed the iron in the tread of the wheel from a soft, dark colored metal with a semi-fibrous fracture, into a metal white in color, hard in character and with a crystalline fracture. If a proper mixture is used, this chilled iron is harder than any steel that can be safely used in a tire, and consequently, under favorable conditions of service, should give excellent mileage results—instances being numerous where a mileage of 200,000, in some cases 300,000 miles has been obtained from 30 and 33-inch chilled wheels. These results cannot, however, be produced with the use of inferior irons, and they are not one of the conditions resulting from this era of extremely low prices.

The separation of the iron in the tread of a wheel into crystals by this peculiar process called chilling, should indicate that although it provided a wearing surface of extreme hardness, yet under certain conditions of service its peculiar crystalline structure would render it liable to defects not applicable to a metal of the structure of wrought iron or steel.

Such defects as are incident to improper manufacture, and for which the manufacturers are undoubtedly liable, we will not here refer to. We wish, however, to call attention to such defects as are incident to the service, and to impress upon railroad officials the importance of guarding against them as much as possible.

Probably more serious defects occur in cast iron wheels from the excessive use of the brake than from all the other causes combined. Excessive heat will destroy the life of the "chill." If by any process it is continued to a "red heat" point, it eventually transforms the crystalline structure back into the semi-fibrous. The application of the brakes, when severe enough to slide the wheel any considerable length of time results in the heating of the tread of that particular point to such a temperature that a separation of the crystals composing the chill occurs, as can be noticed by fine fire cracks on the surface; further service results in a disintegration and shattering out of these crystals. As a result, shelled-out spots occur; such spots being readily distinguished by their ragged, cuppy appearance, and the absence of a high point in the center (like the defect termed a blotch, for which the manufacturer is generally held liable). If the tread of the wheel is broken through these shelled-out spots, the chill will be found to be discolored by the heat to a deep violet color, which discoloration can be produced in no other way.

That this peculiarity was not thoroughly understood by many railway officials is evident, as, until lately, in many instances they claimed that this was a defect for which manufacturers were liable.

The sliding of chilled wheels results not only in the disintegration and shattering out of the chill, but, by expanding the tread, in cracked plates and brackets, and other defects which necessitate the removal of the wheel. If the application of the brake could be more carefully regulated, the life and

safety of the wheel would be increased 100 per cent, and many thousand dollars saved to those who use them.

Whilst the efficiency of chilled wheels may in a measure depend upon the shape and form of the pattern from which they are made, it is not the purpose of this article to enumerate and describe the different patterns of wheels used, although it might be interesting to know that between the years 1849 and 1860 there were no less than 88 patents granted (how many refused is not known) for alleged improvements in the form of patterns of cast iron wheels. The original double-plate wheel, as invented by the late George G. Lobdell in 1838, and the modification of it later into the Atwood-Washburn pattern, and the hollow and solid spoke wheel, practically remain the patterns in use to-day; and it is worthy of note that manufacturers of steel tired wheels in their patterns have followed very closely the same shape or design.

The object and aim of the manufacturers of cast iron chilled wheels have been to meet every requirement of service imposed upon them. Prior to and for some years after the war, the usual guarantee for a 33-inch chilled car wheel under engines, tenders, passenger and freight cars whose weight, capacity, speed and mileage were less than half what they are now, was one year time service. To-day, with an incrase of weight in the wheels of probably 10 per cent, manufacturers have to meet a condition of service requiring for the same diameter of wheel a mileage of not less than 60,000 miles under passenger and tenders, and four years' time service under freight cars.

WHY STEEL BOILER TUBES RAPIDLY CORRODE.

W. H. Gibbons, president of the Parkesburg Iron Co., Parkesburg, Pa., in an article in the *Engineer and Railroad Journal*, finds physical reasons for the rapid corrosion of steel boiler tubes. We quote as follows:

In investigating the oft repeated assertion that "boiler tubes made from steel corrode and become unserviceable much more rapidly than those made from charcoal iron," we have made the following experiments: Taking a "heat" of ingots made of 7 in. x 7 in. weighing about 650 lbs. each, of the best open-hearth basic steel of following analysis: Carbon .10; phosphorus, .014; manganese, .21; sulphur, .026: copper, .05, we first gave them a "wash heat" and cut them into two nearly equal pieces, then transferred them to heating furnaces again, and after another slight heating rolled them down direct to No. 9 guage and sheared them into skelp for 4-inch tubes, being careful to keep separate the skelp made from tops and bottoms of ingots.

We found that the "bottoms" of the ingots invariably worked smooth and clean into plates and sheared with only a normal wastage, but that the "tops" were almost uncontrollable in rolling, working soft, spongy and with much irregularity, and the surface of the plates when finished had a muddy, dirty appearance, indicating an excessive amount of cinder. Allowing one of the "tops" of ingots to cool after the first wash heat, on close examination its whole surface was found to be closely covered with minute holes, so close together that in a diameter of one inch, as many as 25 of these minute holes could be counted, into which in many instances a needle could be entered to the depth of from 1 in. to 1½ in.

Our next step was to nick and break with a heavy drop the upper or "top" of one of these ingots before heating, with the result that the fracture developed an almost entirely spongy or honeycombed structure, extending from ⅛ in. under the skin or surface to about 1¼ in. in depth uniformly around the four sides of the ingot, and in many instances these cells ramified and extended to the centre. Actual count of these cells in face of fracture 6¼ in. x 6¼ in. was 253.

This spongy condition, no doubt, revealed the at first unaccounted-for difference in working between "top" and "bottom," as the same ingot when broken cold, half-way up, showed much less of the cellular structure, which, no doubt, almost entirely disappeared on a nearer approach to the bottom, owing to hydrostatic pressure of molten steel in the mold driving out the gases before solidification occurred.

Our next step was to have tubes made from "tops" and "bottoms," with a report as to the working of the two which only went to confirm our earlier investigations, that the "tops" welded freely, and even blistered sometimes, while the "bottoms" worked hard and stubborn and were difficult to weld. Taking sections of these tubes made from the respective portions of ingot, they were put in a lathe, burnished, and subjected to microscopical examination, which revealed these same "cells" or "honeycomb" structures much decreased in size, but still present in great numbers in the "top" section, while the "bottom" was comparatively smooth and solid.

Each one of these compressed cells has walls of solid metal encasing infinitesimal shot of slag, which in the boiler tube in service, with the incessant expansion and contraction of greater or less heat, will finally open slightly, admitting a little dampness, which under the heated condition of action will undoubtedly set up very rapid corrosion and early disintegration of the whole tube.

Before we had the opportunity of making this thorough test we were at a loss to know why steel tubes made from finest obtainable open-hearth stock should show such short lives when compared with those made from charcoal iron, but this would seem to be ample confirmation, for the known fact that, as a rule, steel has been most disappointing in service when compared with the possibly less pure chemically, but more homogeneous and durable charcoal iron.

To make a free welding steel for boiler tubes, this sponginess must exist, and the more pronounced it is, the more thoroughly it will weld and the more rapidly it will corrode. Conversely, the more solid and free it is from "honeycomb" in the ingot, the more difficult, if not impossible, it is to weld, and the longer the unwelded life in the boiler.

It is a matter of record that the United States cruiser Chicago put new steel tubes into some of her boilers about two years ago, that were riddled with holes as large as shot inside of 40 days' service, while others of her boilers had the original charcoal iron tubes that were put in when they were built, and which were still good after service of some five years.

English Iron Market.

In their review of March 30, S. W. Royce & Co., of Manchester, Eng., say of Middlesbrough pig iron and Midland manufactured iron: "During the early part of this month there was a considerable drop in values of pig iron, but there has since been an upward movement and prices have advanced, though they are still a few pence per ton below those current at the beginning of the month. At present the trade is quiet, but prices are steady, and there is rather a more hopeful feeling, and somewhat more disposition to business on the part of buyers. The shipments of pig iron lately from Middlesbrough have been unsatisfactory, the total for the first three weeks of this month being some 48,000 tons less than during the corresponding period of 1894. The Midland manufactured iron trade is by no means active, but there also there is a hopeful feeling."

THE Crocker-Wheeler Electric Co.'s works at Ampere, near Newark, N. J., were destroyed by fire April 7. Over $50,000 worth of motors and dynamos stored in the building, were destroyed, together with about $30,000 worth of machinery. The building, a brick structure, 300 x 400 feet, was burned to the ground. The total loss will amount to $110,000, on which there was an insurance of $38,000.

THE Wheeler Shipbuilding Co., of Bay City, Mich., has contracted to build for a Detroit syndicate, a steel steamship 400 feet over all, 48 feet beam, and 28 feet depth of hold. It will be completed inside of a year. The new boat is of exactly the same dimensions as the big steamers now being built by the Chicago Shipbuilding Co. They will be the largest boats on the lakes.

THE Cady Mfg. Co., Cleveland, is removing its power press, drop hammer, sprue cutter and special machinery plant to the shops formerly used by the Hackney Hammer Co., 18-22 Johnson st., where the facilities for promptly handling work will be better than ever.

A FIRE at the Black Diamond Steel Works, Pittsburg, Pa., April 5, caused a loss of $10,000. The property is partly covered by insurance. The fire was caused by an explosion of artifical gas.

EFFECTS OF SULPHUR IN CAST IRON.

BY THOS. D. WEST.

In *The Iron Trade Review* of March 28, the writer made the statement that "with proper conditions in melting, as a general thing sulphur is raised twice as much as silicon is lowered in remelting iron." This must not be taken to cover the action of any radical mixture which the founder may make; and in order to more fully define this quality, the writer feels it necessary to treat the subject more at length than space in his last article would permit.

Much of the literature that has appeared up to this date giving tests to show the influence of sulphur in cast iron, has been presented by Mr. Keep by means of records obtained from testing ½" square bars. These results have led Mr. Keep to affirm that the founder has no need to fear sulphur and that cast iron will not absorb sulphur to affect its quality in being remelted. I take a stand entirely on the other side of the question on these points and would say Mr. Keep's conclusions are in error. To sustain my position I would ask the reader to study the following comments and tests, some of which were also briefly outlined in my discussion on the question of testing at the last meeting of the American Society of Mechanical Engineers, referred to in my last paper, and now for the first time published.

In obtaining from test bars any true indications of changes due to increase or decrease of sulphur as affecting the physical properties of an iron, we must use a bar larger than ½" square, and also have the principle of molding such that it will admit of the test bar remaining in contact with its chill until cold. Any system which permits a test bar to contract away from its chill after the moment of solidification, can in no wise record data other than erratic. Also, in being guided by the chill of an iron to judge of its physical properties, it is necessary that there be some means to observe the state of fluidity of an iron going into a test bar at the moment when it is poured, as degrees of temperature in molten metal affect the depth of chill. These are all qualities which the writer has proved in papers on the question of testing. I have of late tried experiments in various ways to sustain my position that in general founding we frequently have good cause to fear evil results from sulphur in iron and fuel, and also from the affinity iron has for sulphur when it is remelted. I offer the following tests, which can be repeated by any who might be desirous of testing this question, but to do so, correct principles in testing, as above outlined, must be followed.

TABLE 6.—SULPHUR TEST.

No. of test.	Quality in Casting.	Micrometer measurement.	Contract'n	Deflection.	Broke at in lbs	Chill.	State of fracture.	Strength per sq. inch.
18	Direct bar.	1.100	6-32	090	1285	½" all	Sound.	1457
19	Sulph. "	1.089	7-32	.050	1863		Sound.	1997

TABLE 7.—CHEMICAL ANALYSIS.

No. of test.		Silicon.	Sulphur.	Manganese.	Phosphorus.
	Iron charged.	.98	.015	.30	.002
18	Direct bar.	.77	.079	.31	.097
19	Sulph. bar.	.85	.175	.37	.097

Test bar No. 18 is one of four which were poured with iron direct from the cupola, with the ladle holding about 100 pounds of metal. After pouring these test bars, about 20 pounds of this metal was then poured into a hand ladle, the bottom lining of which was composed of fire clay mixed with about 2½ ounces of pulverized brimstone. The 20 pounds of metal was allowed to stand in the hand ladle about 40 seconds, when two test bars were poured, both of which, when broken, agreed very closely in strength. The strongest one of these is recorded as test bar No. 19. All these test bars are of the round form and cast on end. It will be seen by a comparison of the analysis of these two test bars, Nos. 18 and 19, that the latter absorbed or contains .096 more sulphur than the bar which was poured direct from the cupola, and .160 more than the iron charged. In breaking these bars it will be seen that the high sulphur bar No. 19 stood 540 pounds more than the direct bar No. 18, thereby asserting that sulphur will strengthen iron. But whether or not such an increase in strength in castings could be beneficial will depend largely upon the internal strains which the addition of sulphur causes in increasing the contraction. This can be seen by Table 6, in which the sulphur bar will be seen to have contracted 1 32 inch more than the direct bar. I have conducted a number of experiments in adding sulphur to the molten metal with iron ranging from one per cent to two per cent of silicon, and have found it to increase the strength of the test bars. But the higher the silicon the less I find its influence in this direction. With two per cent in silicon in testing 1⅛" round bars, I have found it only to increase the strength from 150 to 200 pounds. Just what the limit is in this respect, to have very high silicon affected by sulphur, I am not now prepared to say; but I do know that iron will readily absorb sulphur from the fuel when being remelted, and have records of its increasing at one remelt the percentage of sulphur from .030 to .105, with fuel containing below one per cent of sulphur, and the iron charged averaging about 1.60 of silicon. My observation and experience with sulphur in iron would cause me to say that the least slight variation in percentage of sulphur is more effective in changing degrees of contraction and chill in an iron than a greater percentage of silicon or any other element in iron in such mixtures as are used for making castings in general founding. One point increase in sulphur can neutralize the effect of four to 12 points in silicon.

While sulphur can give increased strength to iron, it is of a character to greatly decrease resistance to deflection or elasticity in iron. On this account I would say that in such castings as chill rolls and ingot molds, which have their surface and body subjected to heat, requiring conditions in metal to admit of expansion and contraction following each other closely, excessive sulphur is to be feared, and in light or medium machinery it is injurious, by increasing the contraction and chill or hardness of castings. The former elements are injurious in causing internal strains, and the latter in causing castings to be harder than desired. I am not prepared to say that equally high contraction or chill which might be caused by very low silicon is any the less injurious than that which can be caused by high sulphur. But of this latter element the founder has need of greater fear, for the simple reason that iron has such an affinity for sulphur in fuel, and can hide its percentages in pig metal and thus cause him trouble, though he may utilize chemistry to aid him in knowing of its existence. There is one redeeming consideration in this question of sulphur, and that is, that while iron has an affinity for sulphur when absorbing heat, it does not take kindly to retaining it when radiating its heat; and if given a chance in a fluid state, sulphur will partly escape. The hotter iron is remelted, and fluxed, also the longer it stands in a fluid state the less sulphur will it contain. The top of a pig generally contains more sulphur than the bottom, owing to its being caught by the top crust in rising to escape.

There is something which causes an affinity for sulphur when iron absorbs heat, and which expels it when solidifying. Just what these influences are, I believe we have yet to truly learn. It is no uncommon occurrence for iron to be as high as three per cent to four per cent in silicon, and contain as much as .200 in sulphur, thereby proving that iron can be high in sulphur, while at the same time it is high in silicon. The writer's experience and advance method of testing would strongly affirm that the founder often has need to fear sulphur, and also that cast iron will absorb sulphur and often very radically. This article is presented from a feeling that the errors and bad castings which statements opposed to those above would lead to should be avoided, and that our advance may be on correct lines in any questions relating to the beneficial and evil effects of sulphur in cast iron.

Are the Tin Plate Figures Growing too Rapidly?

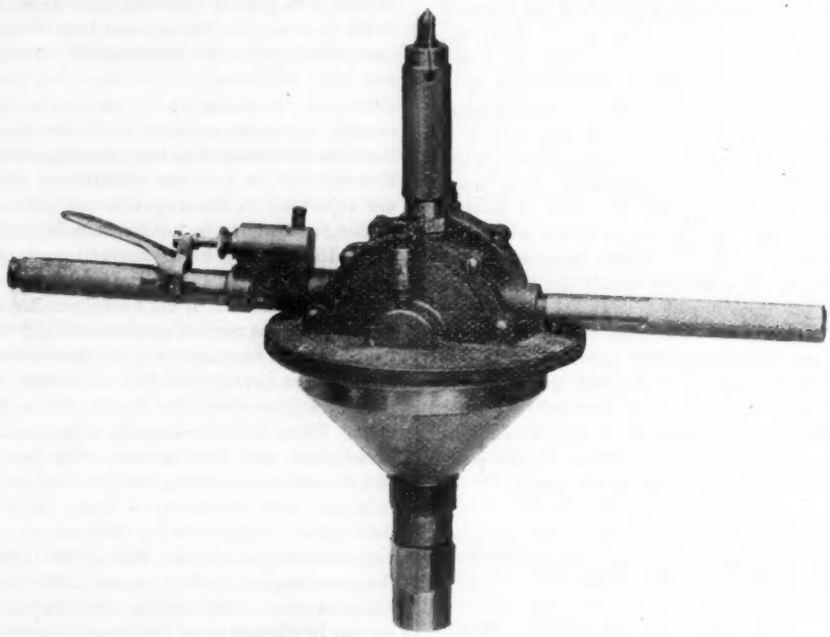
The American Iron and Steel Association has been officially advised that the Treasury Department has ceased the collection of the quarterly statistics of our tin plate production. Col. Ira Ayer, the special agent of the Treasury Department, has done this work with most excellent judgment and with great conscientiousness, and his quarterly reports have been of inestimable value to all friends of that much-needed industry. Col. Ayer's last report was for the quarter ended June 30, 1894, so that the actual operations of the last nine months yet remain to be recorded. Who will record them?—[Bulletin.

DRILLING, REAMING AND TAPPING TOOL.

We illustrate herewith a patented portable drilling, reaming and tapping tool, designed to meet requirements of bridge, ship, boiler and locomotive builders, as well as general heavy metal construction work. The motor is of rotary type, and the cylinder is bored to such a curve that the diametral distance through the axis of rotation is the same at every point of the revolution. This, it is claimed, eliminates the excessive wear or cutting of the cylinder, usual in motors of a rotary type. The thrust of the cutting tool is central to the machine, and the speed is under the instantaneous control of the operator. The admission or throttle valve is controlled by a slight pressure of the thumb, and when the thumb is released, the valve closes automatically and the machine stops. The machines can be operated in any position. The area in which the tool can be handled is only limited by the length of hose connection used.

Two sizes have been placed on the market; the No. 1 size, shown in the illustration, weighing but 28 pounds; and the No. 2 size, a larger machine, intended principally for heavy reaming. It is of the same general design as the No. 1, and weighs 40 pounds. The No. 1 machine is operated by compressed air; the No. 2 by either air or steam pressure.

The following data are furnished by the manufacturers: In the boiler department of the Baldwin Locomotive Works, a



DRILLING, REAMING AND TAPPING TOOL.

number of these tools are in use. Previous to their introduction, the holes for the stay bolts were tapped by hand, 100 one-inch diameter holes being considered a day's work (10 hours) for one man. The tapping is now done by the No. 1 tools, and the average for one machine handled by one man, is 500 holds in 10 hours. At this rate, the cost of the tool is saved in wages alone in two weeks' time, cost of operating compressor for furnishing the air, wear and tear on hose connections, etc., included. The No. 2 size tool is used for reaming all the rivet holes, water legs and dome rings, insuring round, true holes, which in previous practice of hand reaming, was seldom accomplished. As to the rapidity and capacity of the tools for drilling, it may be stated that during a test made by the Board of Inspection and Tests at the Brooklyn Navy Yard, one of the No. 2 tools was run by steam, and 14 holes 1¼-inch diameter, were drilled through a steel boiler plate 1¼ inch thick in one hour, including time required to shift the tool from place to place. Also two holes 1½-inch diameter were drilled through a cast iron block 6⅜ inches thick in 13 and 15 minutes respectively.

The manufacturers are C. H. Haeseler & Co., No. 1025 Hamilton st., Philadelphia.

MR. GEO. C. WRIGHT, formerly salesman for Wm. Jessop & Sons, Ltd., has accepted a position with the Carpenter Steel Co., and no longer represents the former firm.

MACHINERY AT THE ATLANTA EXPOSITION.

The Cotton States and International Exposition to be held in Atlanta, Ga., Sept. 18 to Dec. 31, 1895, is beginning to attract attention from machinery and other manufacturers The Exposition grounds contain 189 acres, and are located about two miles from the center of the city. There are now in course of erection 12 large department buildings, in addition to the one being built by the National Government for its own exhibit, which will be very complete. Various other buildings will be erected by the different countries, states and railway companies. The Machinery building will be 500 feet in length by 100 feet in width. It will have a basement eight feet in depth, through which will extend lengthwise of the building, three main lines of shafting from which power can be taken off to counters, and upwards through the floor at any desired point. In this way all overhead belts and counters will be avoided, and the 100-foot span of the large exhibition hall kept clear. About 4,000 horse power of engines will be shown, and an effort will be made to have these representative of the latest and standard types. These engines will be located in Machinery Hall, and a number will be directly connected to electric generators and others will drive the main shafts, from which power will be conveyed to the various points of application by various methods of belting, rope drives, electrical transmission, etc. An effort will be made to have in this department working exhibits, showing processes, methods of operation, and the manner of application of tools, apparatus, etc. It is claimed that the proportion of working exhibits will be larger than at any exposition ever held in the country. It is the intention to limit the size of any one engine to 300 horse power so that many of the principal builders may be represented and all have an opportunity to run under a suitable load.

The boiler house will contain 5,000 horse power of water tube boilers, consisting of ten batteries of two boilers each. The boiler room will be equipped with all modern appliances —mechanical stokers, and conveyors for handling both coal and ashes. The fuel used will be bituminous. Mr. J. H. Allen, business manager of *Dixie*, is chief of the Machinery Department and it is his purpose to encourage operating exhibits in order that visitors who are interested in the industrial development of the South may have an opportunity of studying the operation of machines that might be applied to Southern manufacture. This principle will apply especially to machines for the manufacture of materials, tools and fabrics not now being made in the South.

THE new quarters of the Prentiss Tool & Supply Co., 62 and 64 S. Canal St., Chicago, nearly opposite their old salesroom, will give them much improved facilities for handling their business, being among the largest, most convenient and most attractive machinery stores in the country.

SHOP AND FOUNDRY NOTES.

Separate Electric Motors Economical.—The Baldwin Locomotive Works having removed the overhead shafting from that portion of its machine shop devoted to wheel work and installed an electric motor for each machine, the saving effected in fuel is said to be nearly 40 per cent.

***

A Question of Quantity in Lathe Work.—Prof. John E. Sweet has again invoked the wrath of the faithful, by criticism of American engine lathes, which if confined to the average type is perfectly correct, but there is one point he does not bring out with prominence. Turning in English shops is mainly piece work, this he remarks, also that the men prefer tools that will do the most work, in fact demand them. This is the main point of all. Suppose that lathes as we commonly make them, were put into a British shop where the contract system exists. The first day would send most of the lathes to hospital. We have tried this and know how it is. A Putnam lathe to turn 12 inches diameter, was given to an English workman to be used for studs and the like. He took off the feed belt at once, also the traversing crank, and put one on three times as long, set a broad-nose tool to turn off small round work, feeding by hand at least one-fourth inch to a revolution. The work was "cut right out," so to speak, at a piece work rate, but true and smooth. All things have a place. —[Industry.

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Melting Point of Cast Iron and Steel.—It would seem that authorities need to get together on the melting temperature of various metals. *Locomotive Engineering* says that in its columns two questions had been answered which related to the melting point of gray cast iron, and it was discovered that there was over 1,000 degrees difference in the melting points given. One question had been answered by one editor of the paper, the other by the other, and each consulted his favorite engineer's book, with the result stated. Then it was determined to compare a few books used for reference. Here is what was found:

	Melting point of cast iron, Fahr.	Melting point of steel, Fahr.
Haswell	2,000 to 2 250	 2,500
Trautwine	1,920 to 2,800	..... 2 370 to 2,500
Clark	2 786	..... 2 372 to 2 552
Ramapo Company's Handbook	2 786	 1873
Scranton Colliery Engineering Company's Handbook	2 192	 2,520
Jones and Laughlin's Handbook	2,210	 2,462
Greenwood	2,912 to 3,452	 3,272
Bolland's Iron Foundry	3,477	 2,501

***

Making the Most of Portable Tools—Competition among manufacturers require all to be equipped with the best and most modern tools and appliances, or fall behind those who are better equipped than themselves. Superior mechanical genius allows some to succeed in certain lines of work above the shop that has more expensive tools. The reason is clear. Suppose a well equipped shop has a large and expensive floor boring machine, with only an occasional job of work to do on it; the investment in such a machine will not be profitable unless it has sufficient work to keep it nearly always busy. But on the other hand, a light, portable boring bar with a positive feed and bearings will be found in the shop not so well equipped in general machine tools. But by a little ingenuity that bar is brought out from its corner, bolted up to the job and work started on it, in some iüstances before the piece could be got into position on the large fixed machine. The money invested in the portable bar is insignificant compared with the fixed machine, and will pay largely on the investment even should it not be called in service except at intervals. Handy portab e tools around the shop are a good paying investment, enabling their possessor to handle work along with his better equipped neighbor, in an up-to-date method, with the advantage of a smaller investment in capital. The modern equipped shop with its 20-ton traveling crane, is a splendid thing for handling work, but it has to be employed profitably and constantly, or the percentage of shop expense will run up pretty high. How about the man that has heavy pieces to handle and has no traveling crane? It is a clear case of doing the best he can. But with good portable tools and ingenuity he can in many cases let the piece lie and handle it so as to fairly compete with the other in the time required to do it.—[H. A. Pedrick in Machinery.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

Brown & Bell, of Joliet, Ill., have recently started a new boiler shop.

The Ellie Iron Co., of St. Louis, has been incorporated with a capital of $100,000.

A. E. Shorthill, Marshalltown, Iowa, wants to buy a second-hand power hammer, pneumatic riveter.

John Cable, 99 S. Canal St., Chicago, wants to lease a double drum 8x10 hoisting engine; also one steam shovel, and 12 2½ to five-yard cars.

A. H. Barber, 229 S. Water St., Chicago, is in the market for a good second-hand engine lathe, about 18 inch swing, six to ten feet bed, compound rest.

M. A. Cutter, of Pittsburg, Pa., together with several other well known capitalists, have organized the American Malleable Iron Co. The plant will be located at Latrobe, Pa.

The Anderson Mfg. Co. has been incorporated at Knoxville, Tenn., by John F. Anderson, W. S. Shields and others. Mr. Anderson recently bought the Knoxville Engine & Pump Works, and will enlarge the plant so as to include the general manufacture of machinery and the operation of a foundry.

New Construction:—

A new rolling and puddling mill is to be erected by the Reading Iron Co., Reading, Pa.

The Pittsburg Locomotive & Car Works are erecting a new power house at a cost of $10,000.

The Granger Foundry & Machine Co., of Providence, R. I., will erect a plant in the near future.

P. J. Foley, Vicksburg, Miss., is building a foundry in addition to his boiler and machine shop.

A new iron foundry is being built by W. A. Nye, of Bourndale, Mass., to replace that recently destroyed by fire.

The McShane Mfg. Co. is rapidly pushing the erection of its new foundry buildings at Dundalk, near Sparrow's Point, Md.

The Frankford Steam Forge Works have just begun the erection of their new plant at Ellwood, Pa., and expect to have it in operation June 1.

The Ellwood (Pa.) Tin Plate Co. is building a new pickling house and store room 45x40 feet. The company has established an office in Cleveland.

The Ellwood (Pa.) Weldless Tube Co. is placing contracts for two steel buildings 50x240 feet and 80x240 feet, intending to double their capacity of seamless tubing.

The B. & O. Railroad will begin work at once on the extensive shops it is to have at Cumberland, Md. The rolling mill at that point has been leased to the Coates Tin Plate Co, of Baltimore, and will be turned into a tin mill.

Plans have been prepared for a large plant for the A. K. Rarig Mfg Co., at Rarig Station, a northern suburb of Columbus, O. The main building will be 632x126 feet, and the pattern building 250x50 feet. The company will put in an electric lighting plant in connection with that for power. The works will be used for manufacturing engines, boilers and rolling mill machinery.

A complete four-mill tin plate plant will be erected at Washington, Pa., in the near future by W. H. Griffiths, of Pittsburg, and a number of other capitalists, who have formed the Washington Tin Plate Co. Plans are being prepared for the tin mill, which will consist of a main building 100x175 feet, to be used as a rolling mill, an annealing and pickling department 60x70 feet, and the tinning house 50x100 feet. The rolling mill will be built of iron, while the remainder of the plant will be constructed of brick. Messrs. Jackson & Evans, of Pittsburg, are the engineers, and will receive bids for the construction and entire equipment of the plant.

John Fraser, engineer, 1436 Monadnock Blk., Chicago, is now getting out the plans for the new works of the Chicago Truck & Steel Castings Co., to be built at Montpelier, Ind. Work has been started on the plant, which will cover five acres of ground; all buildings will be contructed of stone, brick and iron, and are designed for the most economical handling of their product. Besides the manufacture of motor trucks, the company will do an extensive business in steel

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castings and have associated with them as manager of the steel department, Mr. Wm. Chambers, for many years well and favorably known to all users of steel castings.

The S. Freeman & Sons Mfg. Co., of Racine, Wis., widely known in the Northwest as manufacturers of agricultural implements and boilers, recently completed the building of an immense shop on the lake shore at Racine. The main shop is 105 feet wide, 250 feet long. It is of brick with an iron truss roof. An electric crane of 50 feet span has a capacity of 15 tons. Among the tools recently added, besides this crane, is a 9-foot hydraulic riveting machine, a splitting shear and a horizontal flange punch. Near each punch and shears, and at the rolls, are either hydraulic or jib cranes for handling the work. These cranes are so arranged that they take up a plate at one end of the shop and it goes through the different processes at each machine without being let down on the floor until after it is rolled and bolted together for riveting. To the south of the main shop is an engine room and machine shop 36x72 feet, built of brick and iron. In this room is the boiler and engine, the electric dynamo, the accumulator and pump, the lathe, drill press and other machine tools. The shop has a capacity for turning out 2,000 average sized boilers a year. One good feature is that a side track runs right into the shop of sufficient length to allow the loading or unloading of three cars at a time.

Additions, Enlargements, Removals, Etc.:—

Powers & Corry, of Elkton, Md., will enlarge their foundry plant.

The Elwood (Ind.) Iron Co. is arranging to build an addition to its plant.

The Putnam Foundry & Machine Works are making large additions to their plant at Putnam, Conn.

Zug & Co., Ltd., Pittsburg, Pa., will soon begin the erection of a steel and iron rolling mill 100x100 feet in size, and will also erect a sheet iron warehouse 42x100 feet.

The Gates Iron Works, of Chicago, will move their entire plant and offices to the property on Hawthorne and Willow streets, formerly owned by the Chicago Iron Works.

The Warren (R. I.) Foundry & Machine Co. has purchased the property of the Warren Foundry Co., and is making a number of alterations. The officers of the company are John Waterman, president; C. P. Chappen, agent and treasurer, and J. H. Authony, manager.

Fires and Accidents:—

On the morning of Tuesday, April 2, the work shops of the Illinois Safety Heating Co., were partly destroyed by the disastrous fire which visited St. Charles, Ill. A number of valuable drawings and patterns of the company's new heater were consumed. Temporary quarters have been secured and the company hopes to get its samples ready for exhibition within three or four weeks. The fire consumed $75,000 worth of property, mostly owned by stockholders of the company.

Clark & Wheeler's electrical works, near Newark, N. J., were destroyed by fire with dynamos and other machinery, April 7. Loss, $110,000.

A quantity of metal bursting from the cupola at the Steans Mfg Co.'s foundry at Erie, Pa., fatally burned one man and severely burned others.

General Industrial Notes:—

Work has been resumed at the plant of the Kansas City Steel & Iron works.

P. H. Keevan is negotiating with Lorain, O., for the establishment of brass works there.

The Indiana Steel Casting Co., Anderson, Ind., has increased its working force from 75 to 150 men.

The foundry plant of the Smead Co., at Toledo, O., has been sold by the sheriff to C. W. Everett for $26,667.

Five hundred men have resumed work at the Beckwith stove works at Dowagiac, Mich., and the strike is off.

S. L. Boggs, of Allegheny City, Pa., is looking for a location for an enameling works which will employ about 100 men.

The puddle mill of the Chesapeake Nail Works, at Harrisburg, has resumed work after an idleness of three months.

The Lone Star Furnace, at Jefferson, Tex., will be operated by its new owners under the style of the Jefferson Iron Co.

After a period of idleness, the Indiana Car & Foundry Co., of Indianapolis, Ind., has started its plant running to full capacity.

The reported strike of colored furnace laborers at Dunbar, Pa., is denied. Both colored and white common labor is paid $1 for 10 hours.

The Fulton Steam Boiler Works at Richmond, Ind., are running on full time. An improved hydraulic riveting machine is about to be added.

The Bellaire, O., steel plant is reported to be shut down pending the settlement of a wage difference, the company asking a reduction of 10 to 15 per cent.

At Roland, Center Co., Pa., the Eagle charcoal furnace and the iron works connected with it have been started up after a long shut-down, having orders for a run of several months.

Excelsior furnace at Ishpeming, Mich,, made an average record of 60½ tons a day for 12 days recently, the largest out-

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put for a day being 66 tons. This is nearly double the average output of a few years ago.

The Iron Cliffs Co. has plans drawn for a battery of charcoal kilns to be erected this season 30 miles from Gladstone, Mich., the site of its new charcoal furnace. Work on the foundation of the furnace begins this week.

The Pioneer Rerolling Steel Co. is negotiating a lease of the old North Chicago Rolling Mill in Chicago, expecting to put in operation a newly invented process for rerolling steel rails and rendering them fit for relaying.

At the foundry of Mackintosh, Hemphill & Co., Pittsburg, an electric travelling crane weighing 72,000 pounds, with 49 feet span and with a lift, to the line of the rails, of 29 feet, was erected. This included the placing of all the parts, making the electrical connections, etc.

The strike at the Oil City, Pa., boiler works has been declared off. The 400 boiler makers, machinists and molders gave up their demand for a 10 per cent increase, the management demonstrating that the works had only been run, the past year, to give the men employment.

Suit has been entered in U. S. court by Barnum, Richardson & Co., of Connecticut, against the Ensign Car Co., of Huntington, W. Va. The plaintiffs claim $50,000 royalties the defendants having manufactured chilled car wheels under a license to use the patents of the Connecticut company.

A dispatch says that negotiations will soon be consummated by which the Riverside Iron Co., of Wheeling, will lease the Jefferson Iron Works at Steubenville, which are in the hands of a receiver. The Riverside Iron Co. proposes to make repairs, and will begin the operation of the works within a few weeks.

The reorganized company composed chiefly of the creditors of the Akron (O.) Iron Co., has been incorporated as the Akron Iron & Steel Co. The election of officers has not taken place as yet, but it is expected that the new basis of operations and the personnel of the management will be determined within a fortnight.

The schedule of assets and liabilities of the Walter A. Wood Harvester Co., has been filed at St. Paul, Minn. Notes and bills receivable are $1,072,308; real estate, $1,022,939. Other assets bring the total to $3,750,788. Notes payable are $967,162; accounts payable, $155,206; contingent liability, $46,310. Total, $1,168,679.

The Struthers Iron & Steel Co. has been incorporated at Columbus with a capital of $50,000, by Jonathan Warner Jr,, James S. Patterson, L. W. King, J. E. McVey, Harry Robinson. The company has purchased the plant of Summers Bros. & Co., at Struthers, O., and will manufacture sheet iron, sheet steel, tin plate and car iron. An addition will be built to the present plant.

The S. Obermayer Co., of Cincinnati and Chicago, has just received a cargo of East India plumbago direct from Colombo, Ceylon—probably the largest shipment of fine, high-grade silver lead or graphite ever imported. It required 50 cars to carry it from the port of entry to its destination at the factories. This plumbago will be used in the manufacture of standard grades of foundry facings.

The Ohio Steel Co.'s plant at Youngstown, has been hampered by insufficient steam supply, and an additional battery of boilers will be put in. Meantime six locomotives have been brought into requisition. They are arranged side by side near the engine house and steam pipe connections have been made so that the steam they make will be available in driving the machinery of the big plant.

The Bay View plant of the Illinois Steel Co. is being improved by the addition of a 60 horse power engine and angle iron straightening machine. The 9 inch mill is undergoing a thorough overhauling, and wi l be equipped with a 1,000 horse power engine in place of a 750 horse power engine, which has been removed. New "hot beds" used for straightening the product of the rolls are also being put in.

John D. Briggs, of Cleveland, has been appointed receiver of the Findlay (O.) Rolling Mill Co., whose mill was closed last week on an attachment for $40,000. A motion has been filed for the dismissal of that and other attachments so that the receiver can take charge, and it is thought operations will be resumed soon. Receiver Briggs is president of the company. It is stated that the assets are twice the liabilities.

Although steel was made at the steel plant Monday night there is no abatement of the building activity there. The rolling mill department is receiving its finishing touches. It will be ready to run by Monday evening, the time set to start. Four heats of steel, the first since the accident Tuesday, were made yesterday with success. The spiegel cupolas will be started about the middle of next week.—[Lorain, O., Herald, 5th.

The Franklin Land & Mining Co., of Montpelier, Ind., has closed a contract with the Chicago Truck & Steel Castings Co. to locate their works at that city. Work has been begun by the latter company and they expect to be producing steel castings in 60 days and motor trucks in a very short time thereafter. After a careful consideration of various sites the company came to the conclusion that Montpelier had some advantages that make it superior to any other city as a

location for its works; its location in both the gas and oil districts of Indiana, making it an especially favorable point to carry on an iron and steel industry.

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Numerous Excursions at Reasonable Rates.

Whether the tourist's fancy directs him to the New England States or the Atlantic seaboard; to the South; or to the lake region of the North; or to the Rocky Mountains and the wonderland beyond the Mississippi, he will be given opportunity to indulge his tastes at a small cost for railroad fare this year. There will be low rates to Baltimore over the Pennsylvania Lines in May, account the American Medical Association; to Decatur, Ill., account the German Baptist (Dunkard) meeting, and to Pittsburg for the Presbyterian General Assembly. There will also be low rates over these lines to Meridian, Miss., account the General Assembly Cumberland Presbyterian Church the same month. In June, excursion tickets will be sold over the Pennsylvania Lines to Omaha account the National Jr. O. U. A. M.; to Chattanooga, Tenn., for the International Convention of Epworth League; to Cleveland, Ohio, account the National Republican League Meeting, and to Roanoke, Va., for the German Baptist meeting. Excursions for July include low rates over the Pennsylvania to Baltimore for the Baptist Y. P. Union Meeting; to Asbury Park for the L. A. W. Meeting, and to Boston for the Christian Endeavor Convention, and to Denver, Col., account the National Educational Association meeting. In August, excursion tickets will be on sale over the Pennsylvania Lines to Boston, account the Knights Templar Conclave. The sale of low rate tickets will not be restricted to members of the organizations mentioned, but the public generally may take advantage of them.

In addition to the above, there will be plenty of other cheap excursions over the Pennsylvania Lines to various points. As the season is some weeks away, arrangements in detail have not been consummated, but it is certain that no railway will offer better inducements than the liberal concessions in rates and privileges that may be enjoyed by travelers over the Pennsylvania Lines. This fact may readily be ascertained upon application to any passenger or ticket agent of these

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REDUCED rate tickets on the certificate plan are on sale by agents of the Nickel Plate Road to Ft. Wayne, Ind., April 16 to 18, account Women's Baptist Foreign Missionary Society of the West.

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Special low rate excursion tickets with twenty day return limit will be sold March 5th, April 2d and 30th, from ticket stations on the Pennsylvania Lines to points in Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia. For details, apply to nearest Pennsylvania Line Ticket Agent, or address F. Van Dusen, Chief Assistant General Passenger Agent.

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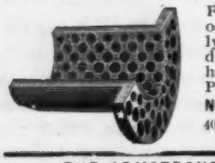

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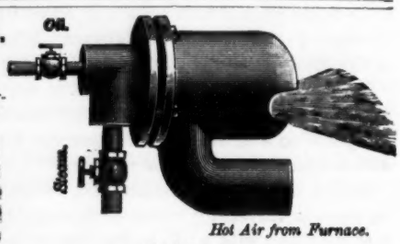

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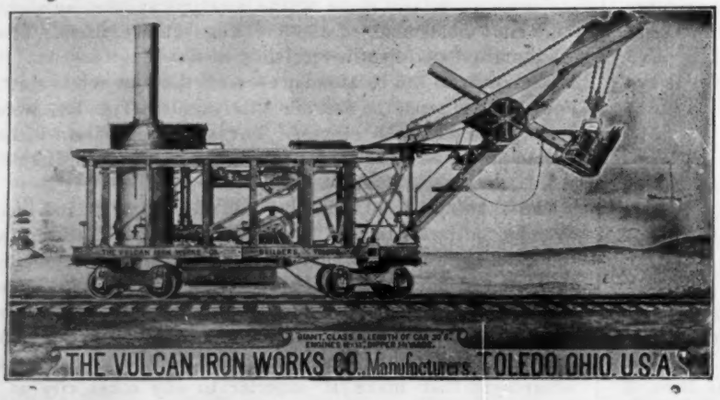

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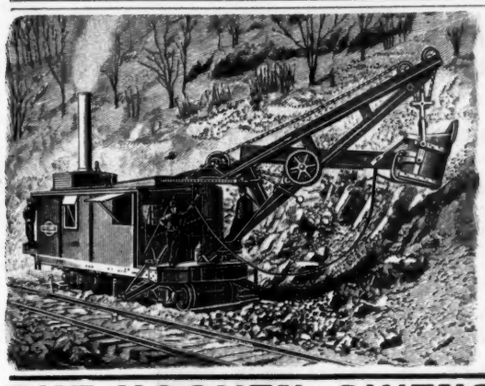

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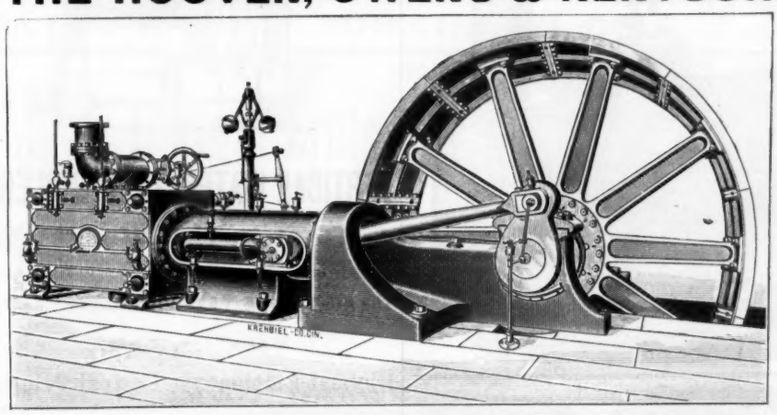

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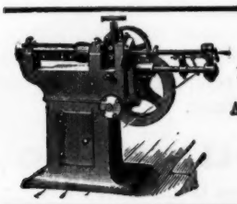

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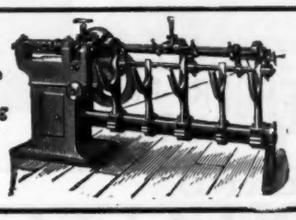

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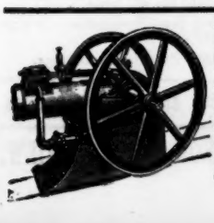

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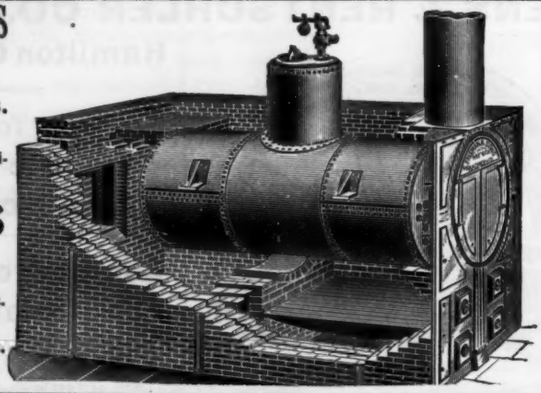

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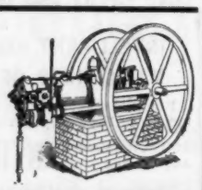

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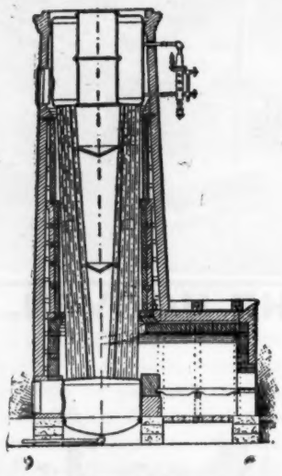

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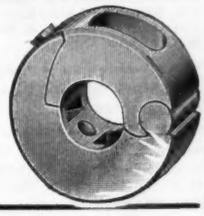

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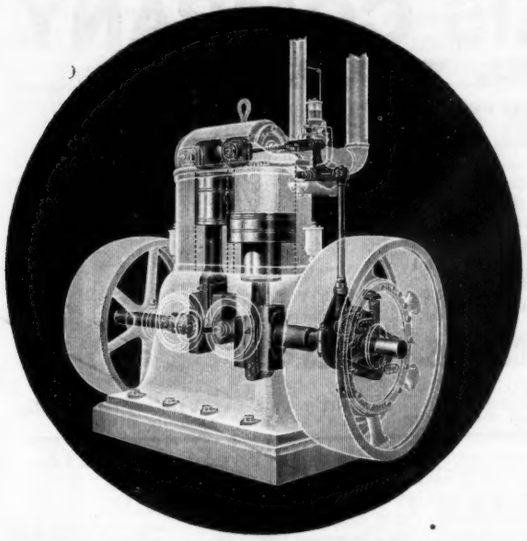

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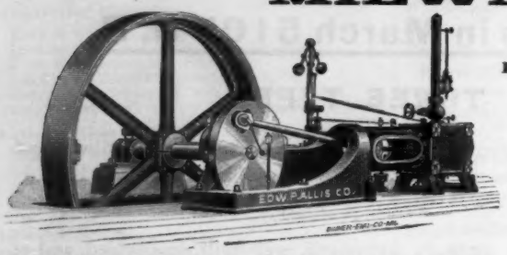

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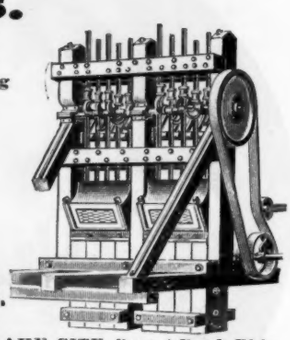

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Oak Hill Fire Brick & Coal Co.	24
Oglebay, Norton & Co.	25
Ohio Sand Co.	28
Otto Gas Engine Co.	18
Parker, Richard A.	27
Pen Argyl Iron Works	27
Pittman, C. K.	2
Pollock, Wm. B. & Co.	2
Pope, E. C.	25
Prentiss Tool & Supply Co.	19
Q. & C. Co	28
Reese, Hammond & Co.	28
Rhoads & Sons	—
‖Sharon Fire Brick Works.	1
Sharpless & Winchell	21
Shaw, Willis	16
Shiffler Bridge Co	25
†Springfield Cupola Co.	—
Stevens, F. B.	28
Stilwell-Bierce & Smith-Vaile Co.	2
Stowe, Fuller & Co.	15
Sturtevant Co., B, F	2
Swarts Metal Co	1
Sykes Iron Roofing Co.	18
†Tabor Mfg. Co.	—
Tanite Co.	28
Taylor & Boggis Foundry Co.	1
Thurman Fuel Oil Burner Co.	16
Timolat, J. G.	19
Tod, Wm. & Co.	20
Toledo Machine & Tool Co.	27
Totten & Hogg I. & S. F'dry Co.	24
Union Mining Co.	15
†United States Graphite Co.	—
United States Heater Co.	28
Upson Nut Co.	19
Vulcan Iron Works	16
Warren, Webster & Co.	27
Wertheim, Ed.	1
Westinghouse Machine Co.	21
Westmoreland Fire Brick Co.	23
Wheeler Boiler Co.	26

NOTICE.

To Steam Users, and others interested in the manufacture, purchase or use of, and sale of Steam Boilers:

Having been granted Letters Patent on a "Safety Water Tube Boiler," of the "type" and "class" in which the Steam and Water drums are arranged and located transversely to the flow of products of combustion in their travel from the furnace to out-take to stack, of which the "Stirling" and "Pierepoint" are examples. My patents covering, in a fundamental degree, devices and arrangements for the maintenance of continous circulation throughout the entire boiler system, and, it having become known to me that certain parties are offering for sale boilers of this class, for which boilers they claim such continuous circulation, it is, therefore, necessary for me to notify manufacturers, users, buyers and sellers, and those who may be acting as agents for the sale of such boilers, that the same are a direct infringement of my patents, which it is my purpose to protect to the utmost extent, at the same time to guarantee to all purchasers of my Boilers the fullest protection against claims or litigation on the part of any and all patentees of Water Tube Boilers.

L. M. MOYES,
(Late Manager Babcock & Wilcox Co.)
Patentee and Manufacturer.
Combine Safety Water Tube Boiler,
411-413 Walnut St., PHILADELPHIA.

Room 508, Cuyahoga Building, **Cleveland, Ohio.**

Jopling & Escobar,
ENGINEERS.

Mining Reports and Estimates. Spanish-American Business a Specialty

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.00@ 2.50
No 1. Specular, non-Bessemer	2.35@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$10 65@$10 75
No. 1 Strong Foundry	10 75@ 11 00
No. 2 Strong Foundry	9 75@ 10 00
No. 1 Gray Forge, red short	9 10@ 9 25
No. 2 Gray Forge, neutral	9 00@ 00 00
No. 1 American Scotch	11 00@ 00 00
No. 2 American Scotch	10 00@ 00 00
Lake Superior Charcoal	13 00@ 13 50

PITTSBURG:

No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 25@ 10 75
Gray Forge	9 10@ 9 25
White and Mottled	9 00@ 0 00
Warm Blast Charcoal	17 00@ 18 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 65@ 00 00

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$13 00@$13 50
Local Coke Foundry No. 1	10 50@ 10 75
Local Coke Foundry No. 2	10 00@ 10 25
Local Coke Foundry No. 3	9 75@ 10 00
Local Scotch Foundry No. 1	10 50@ 10 75
Local Scotch Foundry No. 2	10 00@ 10 25
Local Scotch Foundry No. 3	9 75@ 10 00
Southern Coke No. 1	11 00@ 11 25
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 50@ 9 75
Southern No. 1 Soft	10 00@ 10 25
Southern No. 2 Soft	9 75@ 10 00
Southern Silveries No. 1	11 50@ 11 75
Southern Silveries No. 2	11 25@ 11 50
Jackson Co. Silveries	15 00@ 16 00
Ohio Silveries No. 1	14 00@ 14 50
Ohio Silveries No. 2	13 00@ 13 50
Ohio Strong Softeners	12 50@ 13 00
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	11 00@ 11 50
Coke Bessemer	11 00@ 11 50

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$ 9 50@$10 00
Southern Coke No. 2 and No. 1 Soft	9 00@ 9 25
Hanging Rock Coke, No 1	11 50@ 12 00
Hanging Rock Charcoal No. 1, Fdy	15 00@ 16 50
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Stone Coal No 1	14 00@ 14 50
Southern Coke, Gray Forge	8 25@ 8 50
" " Mottled	8 00@ 8 25
Standard Alabama Car Wheel	15 00@ 16 00
Tennessee " "	14 50@ 15 00
Lake Superior " "	13 50@ 14 00

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	Gross Tons
Old iron rails	$12 50
Old steel rails	10 00
	Net Tons
No. 1 R. R. wrought scrap	$ 9 00
No. 1 wrought scrap	8 00
No. 1 Machine cast scrap	8 00
Iron axles	14 50
Axle turnings	7 50
Wrought turnings (free from cast)	6 50
Cast borings	5 50
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 00
Tank iron	7 50
Hoop and band iron	6 00
Sheet iron	5 50
Wrought drillings	6 50
Malleable iron	8 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.30c@1.35c
Angles	1.20c@1.25c
Tees	1.35c@1.45c
Universal Plates	1.30c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 10
4½ to 6 by ⅜ to 1 inch	1 15
1¾ to 6 by 1½ to 2 inch	1 30
1¼ & 1⅜ by ⅜ to ¾ inch	1 15
1 & 1⅛ by ⅜ to ¾ inch	1 20
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 30

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

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PERFORATED METALS

OF ALL KINDS FOR

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PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.

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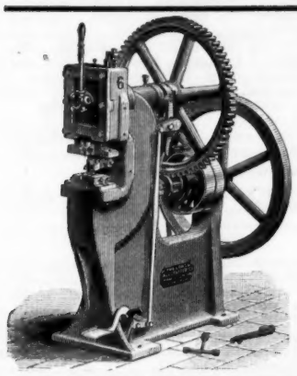
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.



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POWER PUNCHES AND SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc.

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MANUFACTURERS OF HIGH GRADE FIRE BRICKS.

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Works and Mines, Westmoreland, Pa.

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Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

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Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Subscribe for the Iron Trade Review, $3 per year.

Round and Square.

1 to 1⅞ inch	1 10
2 to 2⅝ inch	1 20
2⅝ to 3¼ inch	1 35
3⅜ to 4 inch	1 60
4⅛ to 4½ inch	2 20
4¾ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅜ to ¾ inch	1 30
½	1 50
⅝	1 70

Half Oval and Half Round.

1¼ to 3 inch	1 65
⅜ to 1½ inch	1 45
⅜ to ¾ inch	1 70
½	1 85
⅝	2 95

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1⅜ by ¼ and 5-16 inch	1 25
¾ to ⅞ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 65
1 7-16 to 2, No. 17, 18 and 19	1 70
1 7-16 to 2, No. 20	1 80
1 7-16 to 2, No. 21	1 90
1 7-16 to 2, No. 22	2 00
1⅛ to 1⅜, No. 13, 14 and 15	1 70
1⅛ to 1⅜, No. 16, 17 and 18	1 75
1⅛ to 1⅜, No 19 and 20	1 80
1⅛ to 1⅜, No. 21	1 90
1⅛ to 1⅜, No. 22	2 00
15-16 and 1 inch, No. 13, 14 and 15	1 65
15-16 and 1 inch, No. 16, 17 and 18	1 80
15-16 and 1 inch, No. 19 and 20	1 90
15-16 and 1 inch, No. 21	2 00
15-16 and 1 inch, No. 22	2 10
⅞, No. 13, 14 and 15	1 90
⅞, No. 16, 17 and 18	2 00
⅞, No. 19 and 20	2 10
⅞, No. 21	2 20
⅞, No. 22	2 30
13-16, No. 13, 14 and 15	2 00
13-16, No. 16, 17 and 18	2 10
13-16, No. 19 and 20	2 20
13-16, No. 21	2 30
13-16, No. 22	2 40
¾, No. 13, 14 and 15	2 10
¾, No. 16, 17 and 18	2 25
¾, No. 19 and 20	2 35
¾, No. 21	2 45
¾, No. 22	2 55
11-16, No. 13, 14 and 15	2 35
11-16, No. 16, 17 and 18	2 40
11-16, No. 19 and 20	2 50
11-16, No. 21	2 60
11-16, No. 22	2 70
11-16, No. 23	2 80
⅝, No. 13, 14 and 15	2 40
⅝, No. 16, 17 and 18	2 50
⅝, No. 19 and 20	2 60
⅝, No. 21	2 70
⅝, No. 22	2 80
⅝, No. 23	2 90
9-16, No. 13, 14 and 15	2 60
9-16, No. 16, 17 and 18	2 70
9-16, No. and 20	2 80
9-16, No. 21	2 90
9-16, No. 22	3 00
9-16, No. 23	3 10
7-16 and ½ inch, No. 13, 14 and 15	2 80
7-16 and ½ inch, No. 16, 17 and 18	2 90
7-16 and ½ inch, No. 19 and 20	3 00
7-16 and ½ inch, No. 21	3 10
7-16 and ½ inch, No. 22	3 20
7-16 and ½ inch, No. 23	3 30
⅜, No. 13, 14 and 15	3 30
⅜, No. 16, 17 and 18	3 40
⅜, No. 19 and 20	3 50
⅜, No. 21	4 80
⅜, No. 22	3 90
⅜, No. 23	4 05

Light Band.

1⅛ to 6 by ⅛ to 3-16 inch	1 40
1⅛ to 6 by Nos. 11 and 12	1 45
1 to 1⅜ by ⅛ to 3-16 inch	1 45
1 to 1⅜ by Nos. 11 and 12	1 50
⅞ and 13-16 by ⅛ to 3-16 inch	1 60
⅞ and 13-16 by Nos. 11 and 12	1 65
¾ and 11-16 by ⅛ to 3-16 inch	1 70
¾ and 11-16 by Nos. 11 and 12	1 75
⅝ and 9-16 by ⅛ to 3-16 inch	1 85
⅝ and 9-16 by Nos. 11 and 12	1 90
½ by ⅛ to 3-16 inch	2 00
½ by Nos. 11 and 12	2 05

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 60
⅞ inch, " " " " 13 and 14	1 70
¾ inch, " " " " 11 and 12	1 75
¾ inch, " " " " 13 and 14	1 95

Sheet Iron.

No. 10	1 65
No. 12	1 75
No. 14	1 80
No. 15-17	1 90
No. 18	2 05
No. 20	2 20
No. 22-24	2 30
No. 25 26	2 40
No 27	2 50

Steel Boiler Plates—1-4 in. and Heavier.

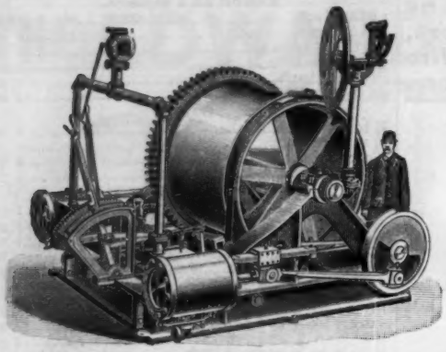
Tank	1 50
Shell	1 70
Flange	1 80
Marine Flange	2 10
Fire Box	3 00

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ½ in. "	08½



HOISTING MACHINERY for Mining, Quarrying, Coal Handling, Pile Driving, Bridge Building, Log Hauling and for general Contractors' Use. Improved Electric Hoists, single and double Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cable Ways.

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BARROWS, COAL BUCKETS, WIRE ROPE, TIP CARS, ETC.

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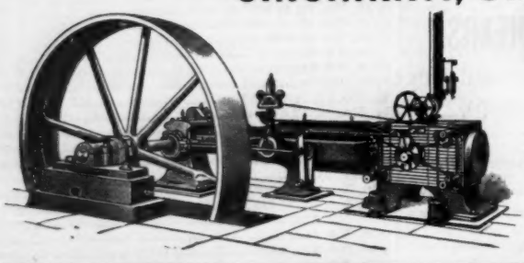

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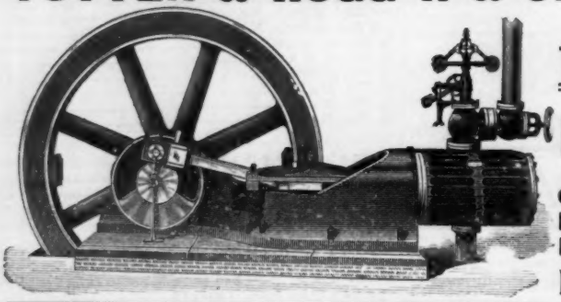
Manufacturers of



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OAK HILL FIRE BRICK AND COAL CO. Manufacturers

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7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in.	.09½
⅜ to 11-16 and 4⅛	.10
⅝ to 6 in.	.10½
⅞ to 9-32 and 6⅛ to 7 in.	.11
7⅛ in	.13

Flats.

	cts. ℔s.
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Machinery	base price,	1 50
Tire	"	1 60
Spring	"	2 10
Sleigh Shoe	"	2 00
Toe Calk	"	2 05
Cutter Shoes, tapered and bent	"	2 10

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 4[illegible]
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis35
Horton's Universal	dis40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1¼"	dis 50&10
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	Flour, C. F 150 gr.	F. FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5½c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
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Will clean them better than any other method.

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THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	† 3:25 pm	† 9:50 am
Hudson and Ravenna	* 5:00 pm	* 8:25 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:40 am	* 5:15 pm
Akron and Columbus	* 8:40 am	*5:15 pm
Akron, Columbus & Zanesville	12:45 pm	*12:10 pm
Akron and Orrville	† 3:25 pm	† 9:50 am
Columbus and Cincinnati	* 8:00 pm	* 6:55 am

Saturdays the 8:00 pm train will leave at 11:20 pm.

Valley Ry. Depot foot of So. Water St. City Office 137 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:30 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Chicago	†2:45 P M	†11:00 A M
Wooster	.....	†6:30 P M
Akron, Canton & Marietta	†2:45 P M	†11:00 A M
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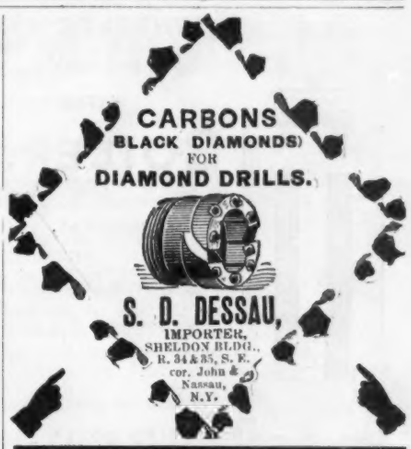

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Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs.	12c
" " " " over 5 lbs.	10c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3¾	3½
Hexagon	15½	11½	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ¶ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 85
Standard Penny Nails, ¶ keg card rate	
Car lots	$1.05
Less than car lots	$1.15

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ¶ doz	dis 10@10&10

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 50
Medart Pulleys	dis 50
Split Wood Pulleys	dis 55@60

Pulley Blocks.

Moore's Anti-Friction Diferential Chain Pulley Block	dis 20

Rivets.

Iron, Thousand, list November 1, 1894	dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

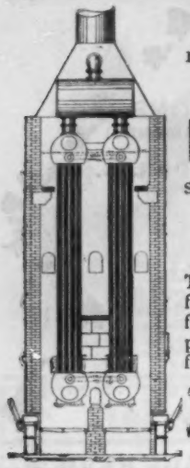
Wire.

New List, Apr. 9, 1894

Brass	dis 40
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ¶ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40



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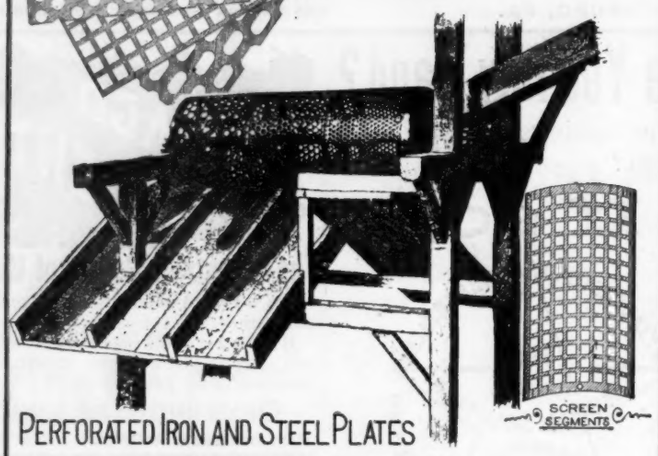

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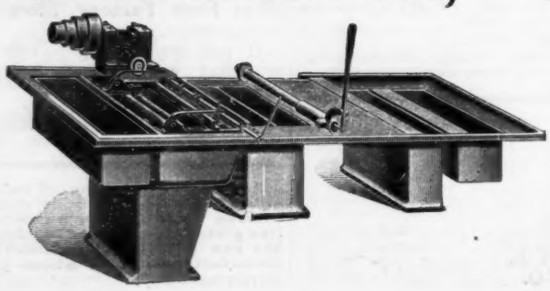

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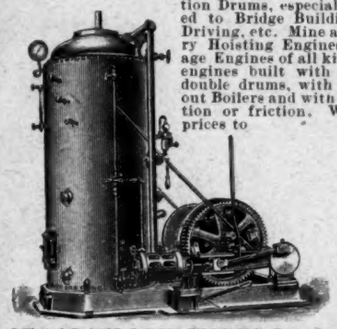

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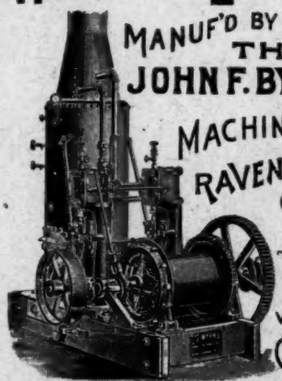

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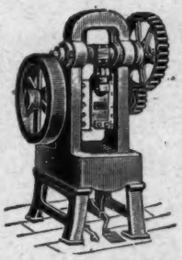

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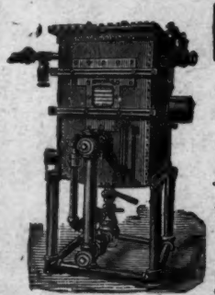

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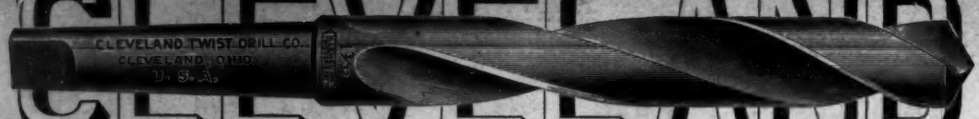

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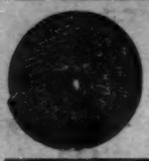

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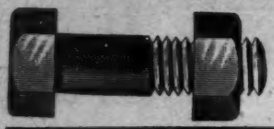

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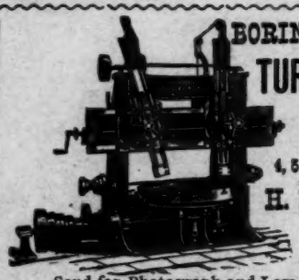

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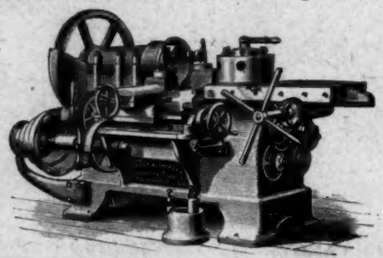

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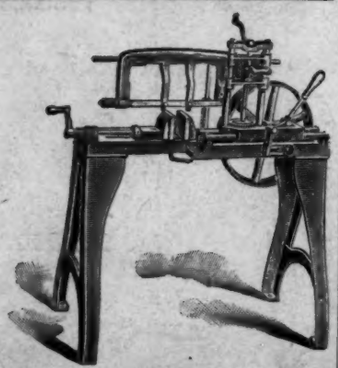

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